HEALTH AND EFFICIENCY

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BY

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DEDICATED

TO THE BEST AND WISEST
OF ALL MY TEACHERS

MY

FATHER AND MOTHER

PREFACE

This book has been written for boys and girls in the Junior and Senior High Schools. It aims to present the fundamental principles of Hygiene and Sanitation in such a way as to lead to better health and greater efficiency. Only sufficient Anatomy and Physiology has been included to form a suitable background for the study of the principles of good living. From an experience of over ten years with High School pupils the author is convinced that too much emphasis has been laid on a technical study of body structure and function and too little on the care of the body. The author believes furthermore that the study of the care of the body is of much more consequence to the High School girl and boy than is a detailed study of its composition. Many teachers attempt problems in Anatomy and Physiology with Secondary School pupils which College and University students find difficult.

The author acknowledges with appreciation the assistance given by the New York City Department of Health; the Massachusetts State Board of Health; the American Posture League; and the U. S. Hygienic Laboratory. To Dr. John L. Tildsley, Associate Superintendent in charge of High Schools and Training Schools, New York City, the author is indebted for a

large share of the interest which he has in educational problems generally and for constant guidance and helpfulness. The outline followed in writing the book is one which was used at the DeWitt Clinton High School, New York City, by the Department of Hygiene. It was completed only by the coöperation of the teachers of Hygiene in that school and by the very friendly helpfulness of the Principal, Dr. Francis H. J. Paul. The Department of Hygiene in the DeWitt Clinton High School is an outgrowth of the Department of Biology of that school of which Dr. Geo. W. Hunter, now Professor of Biology in Knox College, was formerly Chairman. Dr. Hunter was one of the pioneers in the teaching of Biology and Hygiene in this country and the author is indebted to him for many valuable suggestions. In conclusion the author extends his warmest thanks to his wife who has provided constant encouragement and helpful direction to the enterprise.

JOHN DALY MCCARTHY.

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PART I

PERSONAL HYGIENE

CHAPTER I

THE GENERAL STRUCTURE OF THE HUMAN BODY

1. **Introduction.** Man's knowledge of his own body has always been less than his knowledge of vehicles of travel, of habitations, and of machinery. The struggle for existence, the desire for gold, for travel, and for luxury seem always to have been greater than the desire to know the secrets of the human body, the seat of intellect. In fact, at different times, such study of the human body by means of dissection has been forbidden even by some of our own state laws. In view of this prejudice, it is not surprising that men are so little acquainted with their own physical structure, even though a knowledge of the structure of the human body is fundamental to a knowledge of medicine, of hygiene, of sanitation, and in general, to a knowledge of healthy living and human efficiency. The wave of feeling against the use of alcohol has been due, in large part, to a knowledge of what alcohol does to the body after its absorption. Instead of the orgies, so common in the past, when men loaded their bodies with food and drink, we find to-day more and more persons restricting their consumption of beverages and food with a view to making themselves

as efficient as the machines which their minds have devised.

We owe the astounding advances in medicine to a study of the structure of the human body. In olden times it was sometimes even held that disease was due to evil spirits. Fortunately, however, here and there, inquiring and observing men, by applying themselves to a practical study of the human structure gained an immense amount of information about it. We are especially indebted to the Italian scientists, who, many years ago, established centers of inquiry for the pursuit of this study. At the great and famous University of Bologna, very skillful dissections were made as early as the thirteenth century and one of the records of these was a standard text for several hundred years. The traditions thus established finally bore fruit in the great discovery of Pasteur that minute organisms are very frequently the cause of disease.

While men vary in their racial origins, their environment, customs, and tastes, the same fundamental physical structure is a heritage of all. Whether we regard the Scriptural account of the origin of man as indicating that he was formed in a very short period of time, or whether, with Augustine, we regard the body as the product of ages of development from lower forms of life, we must all agree that it is a marvelous structure. So wonderfully perfect is it in its workings that the Psalmist was led to cry out, "I will praise Thee, O Lord; for I am fearfully and wonderfully made."

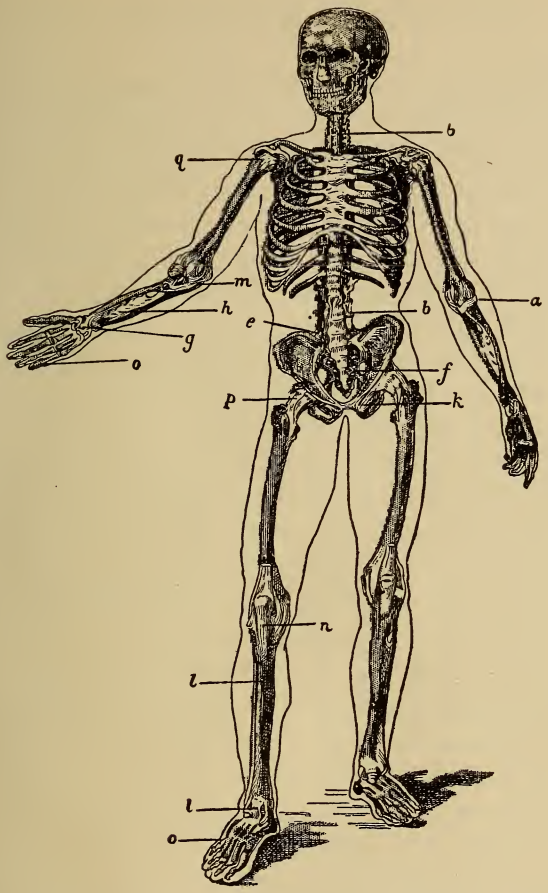


Fig. 1.—A front view of an adult human skeleton to illustrate the mode in which the bones are connected at the joints.

a Ligaments of the Elbow Joint; *b* The Ligament which is connected with the ventral surfaces of the bodies of the Vertebrae; *e* Ligament connecting the Pelvis to the Spine; *f* Ligament connecting the Pelvis to the Sacrum; *g* The Ligaments of the Wrist Joint; *h* The Membrane which fills up the interval between the two bones of the Forearm; *l* A similar Membrane between the two bones of the Leg, and, lower down, *l*, ligaments of the Ankle Joint; *n* Ligaments of the Knee Joint; *oo* Ligaments of the Toes and Fingers; *p* Capsular Ligament of the Hip Joint; *q* Capsular Ligament of the Shoulder Joint.

2. The bony framework and the muscles. Much of our knowledge of the structure of the human body has been gained by first studying the lower animals, both living and dead. The body of a cat or of a fish, for instance, resembles in several ways the human body. Each contains a bony framework which gives it form and strength. This is not present in a worm or a jelly fish, and if it were not present in the human body locomotion would be difficult and many of the more delicate arts like painting, construction, and writing would be impossible. There are about two hundred bones in the human body — varying in size from the tiny bones of the ear to the huge thigh bone of the leg. Reference to Fig. 1 shows that the skeleton is made up, in general, of the skull (the bony framework of the head), the spinal column (backbone), the bones of the shoulders, the bones of the hips, the ribs, and those of the appendages (arms and legs). The skull and spinal column surround and protect the central part of the nervous system — the brain and spinal cord. The backbone is made up of many small parts called vertebræ. The tips of these vertebræ can be felt by running the fingers along the backbone in the living human body. The spinal column, when seen from the side, forms a curve similar to that in an elongated S. This arrangement of the vertebræ is one of the most marvelous adaptations found in Nature. It adds grace to the body, affords protection to some of the organs of the abdomen, and hinders the transmission of shocks from the feet to the head. It should be noted here that although the spine shows a curve when

examined from the side, it forms a straight line in the normal body when seen from behind. The bones of the spinal column, as well as most other bones in the body, act as attachments for muscles. Thus one can feel on each side of the nape of the neck two thick, short muscles running from the base of the skull to the upper part of the spinal column. When these contract, the head is pulled backward. It is as if a thick rubber band were stretched from the rear of the skull to the top of the backbone and attached at these two points. One can easily see that the result would be to bend the head backward. Similarly, two other sets of muscles run along the front part of the backbone and pull the head forward. Consequently, when the pull of the two sets of muscles — front and back — is equal, the head is in such a position that the eyes look straight forward. A similar pairing of muscles is seen in the upper arm where the pull of the muscle on the front of the arm doubles the arm, while the pull of the muscle on the back of the arm straightens it out. Besides serving as attachments for muscles, the bones often protect delicate parts in the interior of the body, as for example the bones of the skull protect the brain, and the rib bones protect the lungs and heart.

Some of the bones, for instance those of the upper arm and of the leg, are hollow, thereby decreasing the weight of the body and adding to the ability of the skeleton to support it in an upright position. Engineers have borrowed this principle from Nature, and made supporting iron pillars for bridges, etc., hollow.

It has been discovered in recent years that the soft, reddish substance often seen in soup bones and called

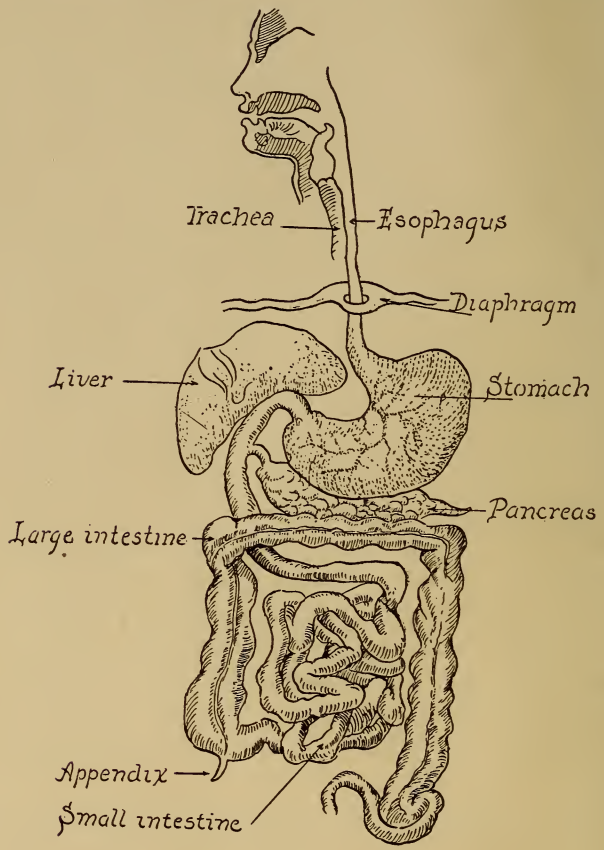


Fig. 2.— The digestive system

" marrow " is the source of a very important part of the blood. In fact several diseases of the blood seem to have their origin in disturbances of the bone marrow.

3. **The digestive canal** is a coiled tube, nearly thirty feet in length, which runs through the body. Reference to Fig. 2 shows that it begins with the mouth and runs through the neck to the stomach. After leaving this organ, it coils from side to side across the abdomen, finally expanding and ending as the large intestine. The part between the stomach and the large intestine is the small intestine and is about 22 feet in length. Near the stomach, connected with the small intestine by means of ducts or canals, is the large, three lobed, reddish brown liver and the small, yellowish pancreas, both of which secrete into the intestine very important fluids which digest our food. At the point where the small intestine passes into the large intestine is a finger-like projection about two or three inches long. This is the appendix. Inflammation of this organ is frequently accompanied by pain in the lower right part of the abdomen. The intestine occupies a large part of the abdomen. In cases of overeating and as a result of certain diseases, huge masses of fat are deposited between the coils of the intestine, producing a protruding abdomen, one of the most hideous deformities of the body.

Demonstrate to the class the general position of your own stomach, liver, small intestine, large intestine, and appendix.

4. **The heart and blood channels.** If you put the palm of the hand on the left side of the chest in the region of the fifth or sixth rib, you will feel a firm tap at least every second. This is produced by the heart, a large muscular organ about the size of the fist, which

contracts and relaxes with pronounced regularity. The heart keeps up its work from birth until death —

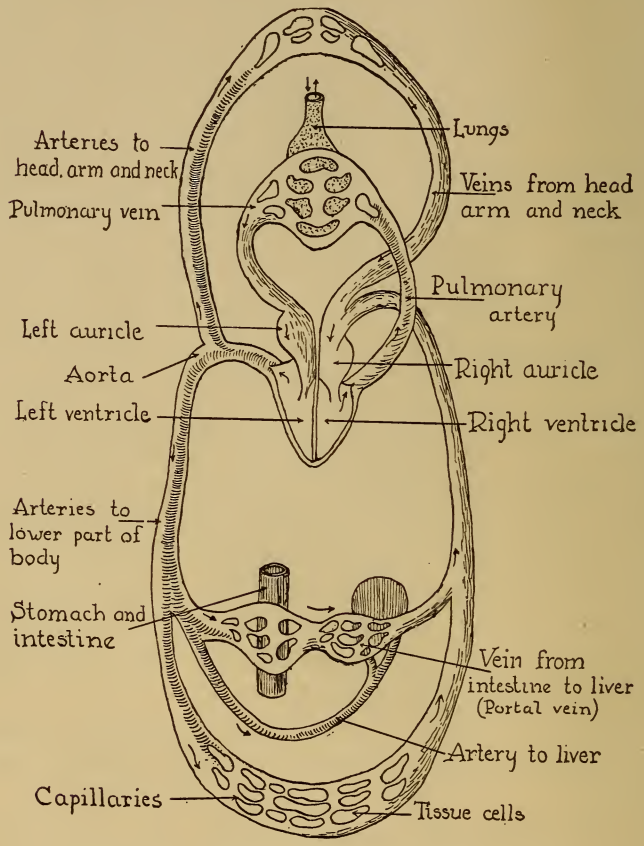


Fig. 3.— Diagram of the circulation

the left ventricle pumping blood into the arteries which carry it to the most remote parts of the body, from where it flows back by way of the veins to the

right auricle to be pumped into the right ventricle. The right ventricle pumps the blood into the pulmonary artery which carries it to the lungs, from where it passes into the pulmonary vein to be carried to the left auricle and thence to the left ventricle. The left ventricle has the strongest walls of any of the four chambers because of the great amount of work it has to do. The four chambers do not work independently but the two auricles contract first, followed a fraction of a second later by a contraction of the ventricles. From the fact that the beat of the heart is felt most distinctly on the left side of the body most persons give that as its location, but, as a matter of fact, it is located about in the middle of the chest, between the two lungs. The best way to study the heart is to get a beef heart at the butcher's and to cut it open. It will be found to contain four chambers, two upper, the auricles, and two lower, the ventricles. Connected with these are muscular tubes, which, when the heart is in its proper place, lead to, or from, various parts of the body. The tubes are the blood vessels and are classified as veins and arteries. If they carry blood to the heart they are called veins and if they carry blood away from the heart they are called arteries. Through them and through the heart the blood circulates in life in a never ending stream, the heart with each contraction pumping blood to the head, to the organs of the abdomen, and to the extremities, and then drawing it back again. The entire time taken for a drop of blood to make a complete circuit of the body is about thirty

seconds. When one remembers that about one-thirteenth of the weight of the body is blood and that the entire amount is kept in constant, rapid circulation,

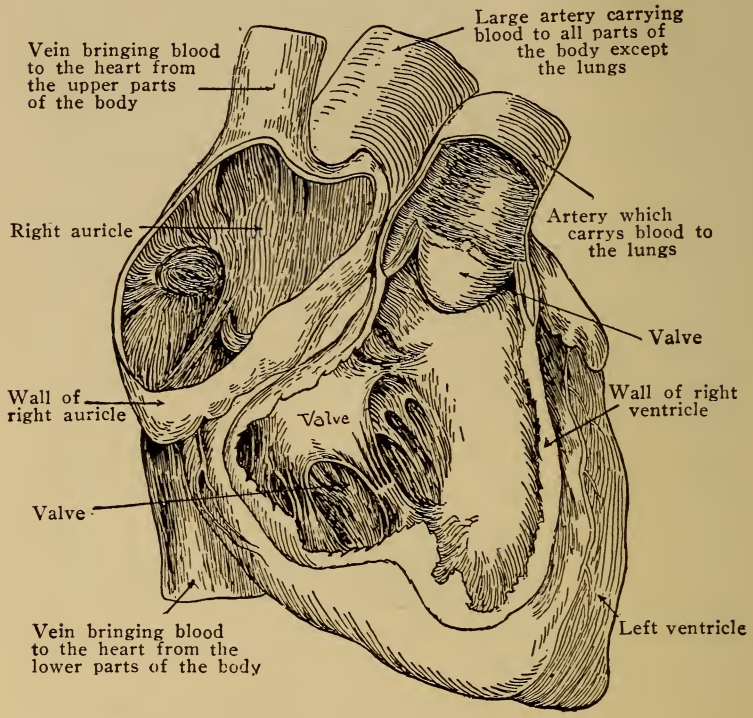


Fig. 4.— Showing the interior of the right side of the heart

he gets a good idea of the amount of work placed on the heart.

5. The organs of breathing consist mainly of the

two lungs, which lie within the chest walls. The air comes through the mouth or nose and thence down the windpipe or trachea to the lungs. Just before the trachea reaches the lungs it subdivides into two short branches, the bronchi, one of which goes toward the right side of the chest, to connect with the right lung; the other toward the left to connect with the left lung.

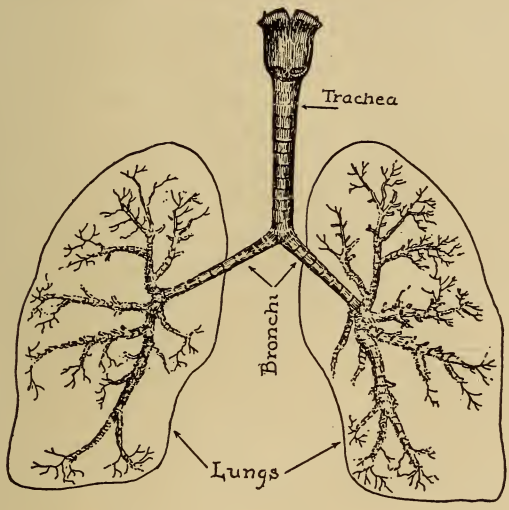


Fig. 5.— The breathing system

Upon entering the lungs, the bronchi at once multiply into an immense number of smaller branches, the bronchial tubes, which in turn divide into smaller ones and thus penetrate to every part of the lungs. The bronchial tubes have very thin walls and each one leads to numerous rounded spaces called air sacs. Surrounding each air sac is a meshwork of tiny blood

vessels. It is estimated that if this meshwork of blood vessels surrounding the air sacs in the two lungs could be patched together, it would cover an area of 800 square feet.

Surrounding each lung is a sheet of thin membrane called the pleura. Sometimes the pleura becomes inflamed and a disease called pleurisy is produced.

6. The brain and other parts of the nervous system. The brain, through which the mind acts, is so complex, both in its structure and function, that it is impossible to thoroughly comprehend the problems which it presents. The brain of a normal male adult Anglo-Saxon averages about three pounds, although the weight may vary from this figure by as much as a pound, and the person be perfectly normal. The human brain is surrounded and protected by the bones of the skull. Although it is provided with few blood vessels in proportion to the work that it does, yet one-fifth of the entire blood supply of the body goes to it. It consists of three main parts called respectively the fore, mid, and hind brain. It is to be noted that the fore brain is the largest of these, and that it is divided into right and left halves, called hemispheres. The brain is not only the seat of thought but it contains centers connected with the organs of seeing, hearing, smelling, etc. So important is the function of these centers that it has been said, "A person does not have a musical ear, he has a musical brain."

A great economy of energy is shown by the brain. Thus the entire brain does not supervise hearing or seeing or thinking, but separate areas are set apart

for each of these functions. Consequently, if a tumor grows on one portion of the brain, the sense of sight is interfered with; if it grows on another portion of the brain, the sense of hearing is interfered with, and so on.

The brain is in contact with the eye, the ear, the nose, etc., by means of lines of communication called nerves. From the hind brain, the spinal cord runs down through the spinal column, giving out branches through the spaces between the vertebræ, and finally completely branching in the region of the small of the back. The branches, or nerves, run to the lungs, heart, stomach, muscles, and other organs. The beating of the heart, the digestion of food, and the action of the muscles are all regulated by impulses sent from the brain, or cord, along the nerves. Vice versa, it is by impulses sent from the skin, eyes and ears along the nerves to the cord and brain that we feel, see, and hear.

CHAPTER II

MAN AND DISEASE

7. Early conceptions of disease. The ideas of primitive man in regard to disease were clothed in mystery. Disease was sometimes thought to be due to evil spirits taking possession of the body. It was then combated by prayer to the good spirits or to the gods of the tribe. In America, each Indian tribe had its Medicine Man, an individual chosen with care and surrounded with considerable dignity. In cases of epidemics, the Medicine Man was called upon to cast out the evil spirits which brought disease. Among more advanced peoples, such as the early Greeks and Romans, disease was thought to be due to a disturbance in the relative amounts of "humors," or fluids, circulating about the body. The conceptions of the Hebrews seem to have been more definite, for Moses drew up for that people an excellent set of laws pertaining to diet, living conditions, and the disposition of wastes.

8. The discoveries of Pasteur. Only recently, however, have we known very definitely the cause of disease. The man who made this great discovery was Louis Pasteur, a French scientist, who died in 1895. Pasteur was a chemist whose attention was attracted to the subject of disease by an epidemic which spread among the silk worms in France during the year 1865.

In the south of France, the manufacture of silk is a very important industry, thousands of persons depending on it for a livelihood. Silk is made by a caterpillar which lives on the leaves of the mulberry and other

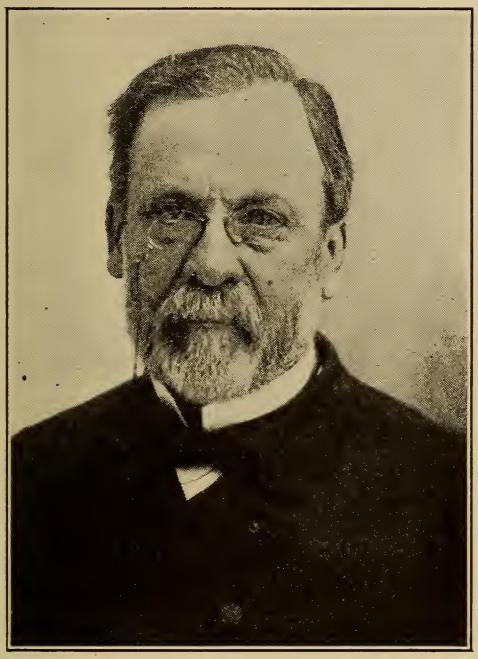


Fig. 6.— Pasteur

trees and which will, if undisturbed, weave about itself a cocoon of white silk in which it will remain for several weeks or months and then come forth as a beautiful moth. The cocoons of at least two species of silk worms can be found in this country, but the silk is not

of a high enough grade to warrant the development of an industry. The silk made by the silk worms of France brings to that country a revenue running up into millions of dollars. In the year 1865 the silk worms were attacked by an unknown disease which killed them before they were able to build cocoons. The silk owners and the Government were aroused. Experts in the raising of silk worms were sent for. Scientists were summoned from their laboratories. But all in vain! Not one of them could stop the epidemic. Finally Pasteur was summoned. He protested that he had no knowledge of silk worms and could be of no service. But he was implored to study the silk worm sickness for even a short time. His work was rewarded by the discovery in the bodies of the sick worms, of tiny creatures which he later proved to be the cause of sickness. He was then able to show the silk growers a remedy for the disease.

In this manner Pasteur became the founder of the very important science of Germ-life or Bacteriology. He extended his studies and made important discoveries in regard to cholera and pneumonia. Later still, becoming interested in the terrible sufferings of children who had been bitten by dogs or cats and who had in consequence developed rabies or hydrophobia, Pasteur was able to prove that the disease was spread through the saliva of the dog or cat. Although he was not able to find the germ causing this disease, he discovered a way to save thousands of lives through a treatment of rabies.

9. **What are germs?** Most persons will reply to

this question, " Why, they are microbes." And if they are asked, " What are microbes? " they will either say that they are germs or that they do not know. Why is it we talk so much about germs and yet know so little about them? The reason is that we know them

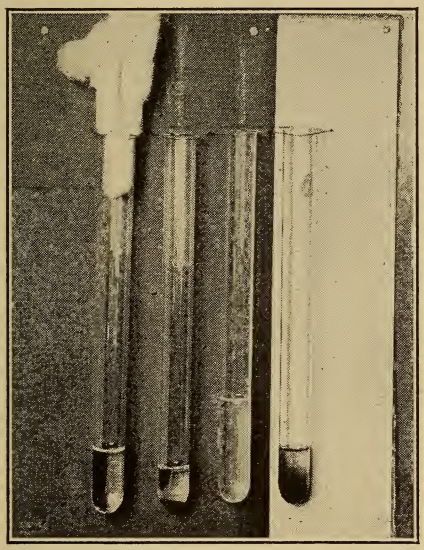


Fig. 7.— Tubes of nutrient material used for growing bacteria. The whitish deposits on the surface represent colonies of bacteria

chiefly by their effects. They are so small that only the largest can be seen with our best microscopes. Some are therefore so small that no one has ever seen them. Here again we know them only by their effects. What are their effects? Among other things they decay food; they cause disease; they sour milk; they tan

leather; they make possible the flax and hemp industries; and they give flavor to cheese and cream. Germs are, in consequence, the friends and foes of man. Some varieties are scrupulously avoided because they produce horrible epidemics of disease; other varieties are carefully cultivated and eaten with food because they are said to improve digestion and assimilation. An example of the former variety is the germ which causes the influenza and which has been the cause of awful plagues and pestilences of the past; an example of the latter is the germ in sour milk, buttermilk, and their commercialized products, Fermillac, Zoolac, etc. Some germs are animals; others are plants. Malaria is caused by a tiny one-celled animal which looks like an amœba. Tuberculosis, on the other hand, is caused by a one-celled plant. Germs were first observed in 1650 by a Jesuit priest — Kircher. Plant germs belong to that division of the plant kingdom called bacteria. Ask your teacher to show you some Bulgarian bacteria under the microscope. They can be bought at the drug stores in compressed masses and then grown in milk. A drop of the milk can then be stained with a dye and the bacteria will stand out distinctly. Men who tend horses or cattle sometimes contract a dreaded disease called anthrax, the germ getting into the system through a cut or a pimple. A case occurred in New York recently, where a man probably contracted it by getting a sliver into his hand from a hitching post. Can you trace the course that the germ took in this case? Other cases are on record of men

contracting it through the handling of hides, leather, furs, or even the use of a shaving brush.

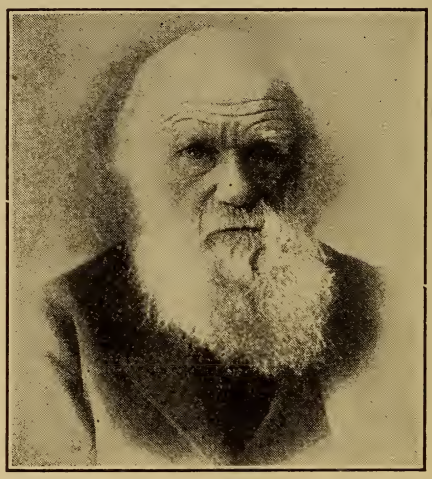
If you have examined the Bulgarian bacteria under the microscope you have found them to be about one-eighth of an inch long. But your microscope magnified

Photograph from Underwood & Underwood

Fig. 8.— Metchnikof, a noted Russian physiologist, successor to Pasteur as director of the Pasteur Institute, Paris

them how much? What was their actual length, therefore? So you see that bacteria are extremely small. They are very different from most plants that you have seen because they are so very tiny and are not green. Bacteria have very curious shapes. In fact, they do not look like living things; but those who

have been so unfortunate as to have harbored the bacteria of diphtheria or influenza know that they are very much alive. They are very simple in structure, being composed of only one cell. If you examine with a microscope a thin section of another plant with which you are familiar, for instance a portion of the



Photograph from Underwood & Underwood

Fig. 9.— Charles Darwin, the great English biologist; founder of the "Darwinian" theory of evolution

leaf of a lily, you notice that it is composed of many tiny structures called cells. These are held together by cell walls, which surround the cells and which are more or less continuous. The cell wall encloses a mass of slimy material somewhat like the white of a raw egg, called living matter or protoplasm. The protoplasm, in turn, usually contains, near its center, a rounded

mass of denser protoplasm, which is called a nucleus. Most of the plants with which we are familiar are very complicated in structure, but not so with bacteria. They are apparently as simple as they are tiny. Each bacterium consists mainly of a minute mass of protoplasm enclosed by a cell wall of cellulose. Some have tiny whip-like projections from their bodies by means of which they swim about in liquids. They swarm almost everywhere but are particularly abundant in filth, decaying flesh, and in stagnant water. They increase in number at an incredible rate; when a bacterium reaches a certain size it simply divides into two bacteria. Since the bacteria grow very fast when they receive plenty of food and since they sometimes divide as often as once in twenty minutes, millions may be formed in a day. Take a pencil and paper and figure it out for yourself.

10. How do we know that germs may produce disease? As was indicated in the first part of this chapter, it took man a long time to learn that disease may be caused by germs. Indeed there are some educated people to-day who do not believe it. In view of this, it would be well to examine into the reasons for believing in one of the greatest discoveries of all time — the Germ Theory of Disease. In the first place, it is well to note that the leaders in the study of this field have all been hard-headed scientists — such men as Pasteur, Koch, and Lister — men to whom only seeing is believing. Pasteur said, "In experimental science, it is always a mistake not to doubt when facts do not compel affirmation." So much of a doubter was Koch that

he lay down four tests, or postulates, as he called them, which an investigator must satisfy if he wishes to convince others that he has discovered the germ causing a certain disease. First, Koch said, the investigator must show that the germ described is invariably found in the diseased part — in the case of ordinary tuberculosis it would be the lung: Secondly, he must grow the germ in pure culture; that is, he must cause it to grow outside the body on some culture substance like gelatin or

Fig. 10.— A modern method of treating tuberculosis

albumen and unmixed with any other form of germ: Thirdly, this germ, when injected into the body of an animal like a rabbit or guinea pig, must produce the disease under consideration: Fourthly, the germ must be recovered from the diseased part of the sick animal. When medical science, therefore, assures us that the

cause of a certain disease has been found, we may understand that the case has been subjected to a most searching and critical examination.

11. Action of germs in the body. It is almost incomprehensible that such tiny and simple creatures as germs could produce horrible diseases and even death. Yet such is the case. How do they do it? Well, for instance, the germ causing tuberculosis produces disease by slowly consuming the lungs or other parts of the body. This germ, therefore, which is so

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Fig. 11.—"Muffled faces"—to halt the influenza epidemic

small that it is difficult to find it even with a high-powered microscope, is capable of causing conditions which produce the sweats, fever, and shrunken bodies of tubercular people. Other diseases, as for instance diphtheria, are produced by germs which secrete poisons or toxins. These toxins are carried by the blood stream all over the body, affecting certain tissues or organs and thus producing the symptoms characteristic of the disease. Since the body frequently offers a favorable

condition for the growth and multiplication of bacteria, a few finding lodgment may cause untold harm in a short time.

12. How do germs spread from one person to another?—The influenza epidemic, which played such havoc throughout the world, started in Russia, swept through the Scandinavian countries, then went into England, Germany, France, Spain, and finally reached America. How was it carried? If we knew the germ that causes influenza it would be much easier to answer this question. But from its general nature and from its resemblance to other diseases, as for instance grippe, medical authorities believe that it was spread largely by means of the discharges from human bodies, principally by coughing, sneezing, or talking with effort close to another person. When a person sneezes or coughs into the air tiny droplets of moisture pass from his mouth in the form of a fine spray as you have probably noticed. These droplets of moisture remain suspended in the air, perhaps for some time. They are very apt to contain germs gathered from the person's mouth, nose, and throat and may consequently spread such diseases as colds, grippe, and influenza. For this reason no intelligent person coughs or sneezes into the air. A handkerchief should always be put over the mouth and nose to catch their discharges. The influenza epidemic may have been spread also by handshaking, kissing, and by the use of common towels and drinking cups. Since communicable diseases, that is to say diseases which may be carried from one person to another, are caused by germs, any object coming in

contact with a diseased person may transmit the sickness. Thus lead-pencils, drinking and eating utensils, straps on trolley cars, door knobs, etc., may convey the germs causing disease. For this reason the face, hands, and neck should be washed as soon as a pupil reaches home. It should be remembered, however, that such objects as some of those first mentioned would furnish no food for the germs and that the latter would consequently die in a short time if left upon them. How-

Fig. 12.— Properly cleaned utensils to be used in handling milk

ever, common towels, door knobs, and car straps are in constant use and new deposits of germs are being made constantly.

Some very severe diseases such as typhoid fever, tuberculosis, and scarlet fever may be transmitted by using food containing them. Before public health education was as well developed as it is now, typhoid epidemics were altogether too frequently brought about

by using water or milk infected by typhoid bacteria. While more care is taken with milk and water to-day, not enough attention is paid to flies. These insects feed on both filth and human food and not infrequently alight on our food with their feet covered with typhoid germs. It is easy to see how under such conditions bacteria may be taken in with our food. If conditions are favorable to growth and reproduction such bacteria produce toxins which are sometimes so powerful as to cause prostration and even death.

Curiously enough, some persons may harbor disease germs and not have the disease. There are a few cases on record where the germs of diphtheria or typhoid have been growing and reproducing in the bodies of persons who have never had the disease. Such persons are called " carriers " and they may cause epidemics of disease. One of the best known " carriers " is a woman in New York who was employed as a cook for years. She is known as" Typhoid Mary " and the New York City Department of Health has traced to her over twenty cases of typhoid in families where she has been employed. The Department of Health was able to secure from her a promise that she would not seek employment as a cook. In 1914 typhoid broke out in a maternity hospital in New York and several mothers and babies were infected. An examination of the milk and water failed to show the method by which the disease had been transmitted, and it was only after a visiting physician had recognized a worker in the kitchen as " Typhoid Mary " that the epidemic was controlled. It

is supposed that she transmitted the disease to the patients in the hospital by means of salads, the fresh vegtables of which she prepared for the wards.

13. How does the body fight disease? One naturally wonders why it is that disease is not more prevalent, when one considers how closely human beings associate to-day, through how many hands food passes, and how careless some persons are about sneezing and spitting. We should exercise the greatest vigilance to prevent the acquisition or transmission of disease. If we do we can cut down the death rate appreciably. This is clearly recognized by the health departments in all of our States. In New York, the State Department

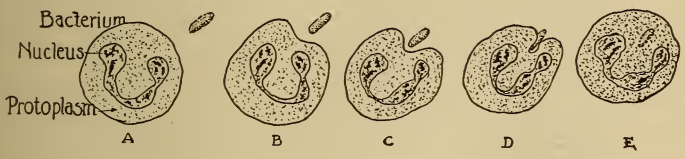


Fig. 13.— A white blood cell eating a bacterium

of Health has adopted a slogan, " Public Health is Purchaseable." Think about this statement and you will discover several ways in which public health is purchaseable. If we try to live up to the rules and laws laid down by Departments of Health, we will find that we have a good friend in Nature to whom disease is sinful. We have been endowed with very wonderful bodies, made up of parts which work together in a very delicate harmony, providing they are not abused by excesses or lack of exercise or by poisons from without.

In order to keep out disease germs, Nature has clothed us in a tenacious tissue of skin. Sometimes this becomes torn or cut and disease germs get into the blood stream. Does this mean that we get a disease? Not necessarily, for moving about in the blood are tiny cells which act as the policemen of the body. These cells are not exactly like the cells that we found in the leaf of the lily, for in the first place, they are not joined together, but move about independently of one another; furthermore, they have no cell wall and each one is capable of changing its shape. There are millions of them in the blood stream, moving about through the tissues, seeking germs which they may destroy. Fig. 13 shows one of these cells attacking a bacterium. They are called white blood cells, or leucocytes. When a leucocyte approaches a germ, it spreads out its protoplasm, gradually surrounds the germ, kills and digests it. Germs, then, are the food of leucocytes and we should do all that we can to insure vigor to our bodies in order that these policemen may always be active. It has been discovered also that the liquid part of the blood contains chemicals which have the power of rendering disease batceria harmless. From the fact that the blood has the power of killing germs it is said to be germicidal. The germicidal power is not constant, however, but varies with individuals and with conditions.

14. **How can man help Nature fight disease?** As was pointed out in the preceding paragraph, a cut or a torn skin may be the portal for the entrance of disease germs, which may develop into a serious case of

blood poisoning or anthrax. Blood poisoning is a disease in which certain kinds of germs are found circulating in the blood. Anthrax is a disease of cattle and sheep in which ulcers are formed and severe symptoms of collapse are seen. It is found from time to time among human beings and is said to be transmitted by shaving brushes, furs, and the hides of animals. While the leucocytes may be successful in their

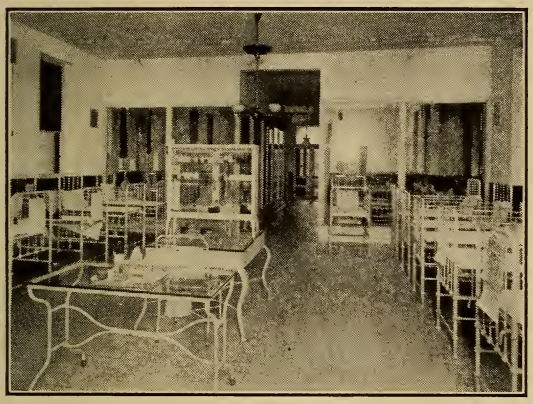


Fig. 14.— The scarlet fever ward of a modern hospital

fight against disease sometimes, often they are unsuccessful. We must not leave all to Nature, therefore, but must assist Nature at every turn. A pin prick, a bleeding gum, an inflamed tonsil, or a sliver in the hand may seem to be too trifling to need attention, but we know now that such is not the case. A bruise should first be cleaned of such foreign matter as dirt and then washed with an antiseptic of which there are many kinds. Can you give the names and methods of

applying three? After the bruise has been cleaned and washed with an antiseptic, a clean bandage may be applied to keep out more germs. This treatment, if applied immediately, will usually suffice, as the antiseptic should check the growth of the bacteria or in some cases kill them.

15. What happens when we are vaccinated. Another, more complicated method of fighting disease was discovered by an English physician named Jenner. Jenner had been told by people in the country districts of England that milkmaids were not apt to be infected with smallpox, which was, at that time, a very horrible and common disease. He investigated the story and found it to be true. The reason was that the women in milking got on their hands some of the pus from the cowpox, which commonly affected the cattle and which is probably a mild form of small pox, and this pus gained entrance to the blood through cuts, etc., in the skin. In the blood the pus of the cowpox stimulated the tissues to form chemicals which had a germicidal property toward any smallpox germs which might later gain entrance into the body. Such a person was, therefore, immune to smallpox, and the immunity had been acquired. While some persons are immune to smallpox from birth, and are consequently said to be naturally immune, most persons are easily susceptible to it. In view of this, and in view of the virulence of the disease, it is advisable to adopt the procedure advocated by Jenner, that of vaccination. This consists in scratching the skin with a pointed instrument and rubbing into the tissues under the skin

the virus taken from blisters or swellings found on cattle with cowpox. In a few days a small solid elevation appears at the site of inoculation, folowed in a few more days by a small sac, filled with liquid. After eight days the area around the sac becomes red and finally a scab forms. This later falls off, leaving a scar. The process of vaccination is therefore a simple one and at the same time so efficacious that it has been called the greatest single benefit ever conferred

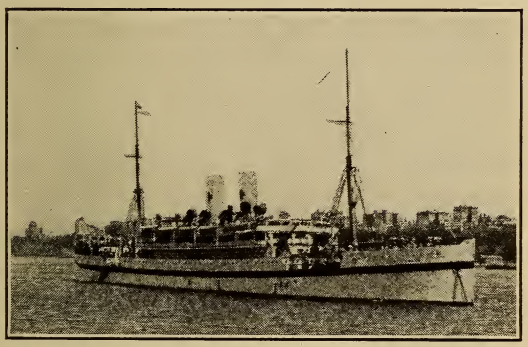


Fig. 15.—A Red Cross boat taking little sufferers for a day's outing

by one man upon the human race. The value of it was indicated sharply at the time of the Franco-Prussian War. An epidemic of smallpox was raging and the German soldiers had been vaccinated against it while the French had not. The German mortality from the disease was 450, while the French was 23,400.

16. Diphtheria and the use of antitoxin. It is said that a king of ancient Greece accustomed himself to poison by taking it in very small doses and gradually

increasing the amount until the ordinarily fatal dose had no effect. It was discovered about 25 years ago that diphtheria germs grown in broth produced a poison, or toxin, which could be injected into an animal in gradually increasing doses, until a dose, large enough to kill a great many animals which had not been accustomed to it, could be given. Later, it was learned that the blood serum from such an animal, if injected into another animal, rendered the latter immune to the poison. The reason for this is that the blood of the first animal developes an antitoxin to neutralize the toxin from the diphtheria germs. This antitoxin is known as diphtheria antitoxin and is now prepared from the blood of horses. In cases of suspected diphtheria the first treatment consists in the introduction of diphtheria antitoxin into the blood of the patient. It can not be too strongly emphasized that this must be done as early as possible. Do not neglect to consult a physician in case you have a sore throat in which a white patch can be seen; or when the sore throat has developed after exposure to a known case of diphtheria; or when you have a sore throat accompanied by fever and general indisposition.

17. **The treatment of disease by the use of serums and vaccines.** The blood is made up of a solid and liquid portion. If it is allowed to clot, a solid portion may be strained off, leaving the liquid portion, or serum. We have seen in the case of diphtheria and smallpox, that the serum of an animal may, under certain conditions, contain substances called antibodies which are able to counteract or neutralize the poisons

or toxins of disease germs. In some cases the antibodies of smallpox are present in the blood from birth and persons who are so fortunate do not contract smallpox and they are said to be naturally immune to the disease. On the other hand the antibodies, or else sub-

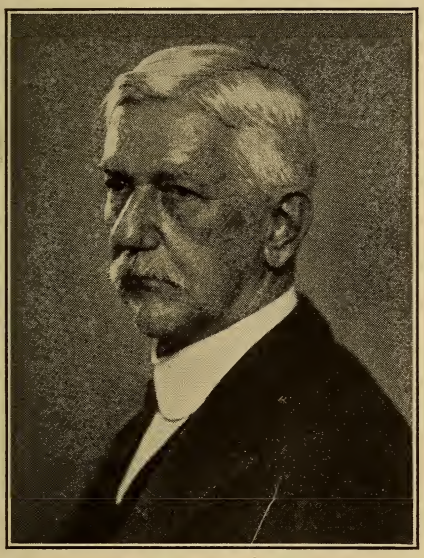


FIG. 16.— Former Surgeon General Gorgas, especially noted for his work in freeing Havanna from yellow fever

stances which will cause the tissues to produce them, may be injected into the blood and the person may thus acquire an immunity to the particular disease. Since each disease germ produces its own specific poison or toxin, the antitoxin or antibody used must be

the specific one which will neutralize that particular toxin. Antibodies is the general term used to indicate the protective substances which are generated by the animal against the invading disease germ. Antitoxin is one variety of antibody.

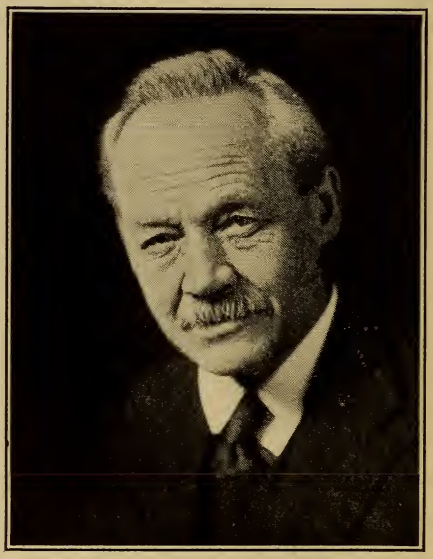


Fig. 17.— Dr. Wilfred T. Grenfell, Medical Missionary of the Frozen North

Usually the most lasting form of immunity is that which is acquired by the tissue cells of the animal producing specific antibodies against the invading germ. A lasting degree of this form of immunity usually follows recovery from smallpox, scarlatina, measles, and typhoid fever. As a result, the individual does not have

a repetition of the particular disease. In other diseases — pneumonia for instance — the immunity, if present at all, lasts for only a short time. In either case, the degree of immunity is not in proportion to the severity of the disease, since a lifelong immunity may follow a mild infection, or a severe infection may be followed by no immunity, or one of short duration.

The foundations of the science of immunity were laid by Pasteur, who found that he was able to produce a form of chicken cholera germ which he could inject into fowls without producing a severe form of cholera. Pasteur accomplished this by cultivating the germ over a long period of time, so that the strain became weakened. Injection of this weakened germ caused the tissues of the fowl to produce the specific antibodies and thereafter the fowl was immune to any form of the disease. Pasteur later found that germs could be weakened by exposing them to certain temperatures for varying lengths of time, and also, in the case of one disease, the virus (the material supposedly containing the germ) could be weakened by drying.

Artificial immunity may be produced by (a) the use of a serum or (b) the use of a vaccine. By serum therapy we mean the process of immunization induced for the purpose of preventing or curing a disease, by means of the injection into the blood of the serum of another animal which has been actively immunized. against the particular disease. An example of this process is the injection of diphtheria antitoxin. Vaccine therapy differs from serum therapy. It is the

process of making the tissues immune by the injection of dead bacteria directly into the tissues. An instance of vaccination by the injection of disease germs is that of typhoid vaccination. The typhoid vaccine is prepared by putting a definite number of typhoid bacteria in salt water and heating them until they are dead. If this weakened germ is injected under the skin the process is not followed by any lasting ill effects and a high degree of immunity is produced.

CHAPTER III

POSTURE AND EXERCISE

18. Posture and military life. The importance of maintaining good posture in order to secure good health and also the prevalence of remedial defects of posture were brought forcefully to our attention in 1917, when it was found that a large percentage of the young men of the country subject to military service were unfit for such service because of physical defects. The examining physicians were amazed at the number of cases of flat feet, spinal curvature, hollow chests, and protruding abdomens. So general were these defects that the following letter was sent out from the Office of the Adjutant General at Washington:

"Perhaps the most glaring faults noted in aspirants to the Officers' Reserve Corps and one that might be corrected by proper attention in our high schools, preparatory schools, and colleges, might be characterized by the general word 'Slouchiness' I refer to what might be termed a mental and physical indifference. I have observed at my camp otherwise excellent men who have failed because in our school system sufficient emphasis is not placed upon the avoidance of this mental and physical handicap.

"At military camps throughout the country mental

alertness, accuracy in thinking and acting, clearness in enunciation, sureness and ease of carriage and bearing must be insisted upon, for two reasons — that success may be assured as nearly as human effort can guarantee it with the material and means at hand, and that priceless human lives may not be criminally sacrificed. Only

From plate loaned by the American Posture League.

Fig. 18.— In the middle a girl in good posture. What are the defects of posture shown by the girls on each side?

by the possession of the qualities referred to does one become a natural leader.

"A great number of men have failed at camp because of inability to articulate clearly. Many men disqualified by this handicap might have become officers under their country's flag, had they been properly trained in school and college.

"It is hoped therefore that more emphasis will be

placed upon the basic principles of elocution in the training of our youth . . . Great improvement could be wrought by instructors in our schools and colleges, regardless of the subject, insisting that all answers be given in a loud, clear, well rounded voice, which, of course, necessitates the opening of the mouth and free movement of the lips.

"In addition to this physical disability and slouchiness is what might be termed the slouchiness of mental attitude. Many men have not been trained to appreciate the importance of accuracy in thinking. Too many schools are satisfied with an approximate answer to questions. Little or no incentive is given increased mental effort to coördinate one's ideas and present them clearly and unequivocally . . .

"I have further noted at camp that even some of our better military schools have turned out products that, while many of them have the bearing of a soldier in the ranks, yet their carriage is totally different as soon as they 'fall out.' Schools, military and non-military, should place more insistence upon the bearing of pupils all the time. It should become a second nature with them to walk and carry themselves with the bearing of an officer and a gentleman.

"As a last important element that seems to me has been lacking in the moral and mental make-up of some of our students here, is the characteristic of grit. Not that they would have proven cowardly in battle, necessarily, but some have exhibited a tendency to throw up the sponge upon the administration of severe rebuke or criticism. Their 'feelings have been hurt' and they

resign. They have never been taught the true spirit of subordination. They are not ready for the rough edges of life. The true training school should endeavor to keep one's eyes fixed upon the goal rather than upon the roughness of the path, to realize that one unable to rise above the hard knocks of discipline cannot hope to face with equanimity the tremendous

From plate loaned by the American Posture League

Fig. 19.— In the middle a boy in good posture. What are the defects of posture shown by the boys on each side?

responsibilities of the officer under modern conditions of warfare. This ideal of grit belongs in the school room as well as upon the campus."

In spite, however, of the general slouchiness referred to here, and of other defects of posture, the military authorities, by patient and intelligent direction, were able to accomplish wonders with the material with which they had to work. Many young men will owe not only sound health but success in business and professional life to the careful training of their bodies, which they received during their period of service.

19. Bad posture may be the result of disease. The importance of bad posture as a symptom of disease has probably not received the attention that it deserves. Bad posture is too often considered merely a lack of attention to proper carriage. Of course, in many cases, it is this, but very often it is the definite result of a diseased condition. The effect of disease on posture is very marked in the case of tuberculosis. Every one has noticed the emaciation, the hollow chest, and the stoop — the consumptive stoop — so characteristic of this disease. One eminent physician has said that the first remedial measure which he undertakes with a tubercular patient is to recommend the daily performance of physical exercises calculated to correct the defect of posture.

The stoop caused by a rheumatic condition, particularly in old people, is a matter of common observation. That defective posture may be the result of nervous exhaustion or of some organic debility, has not been so clearly noted. In the case of boys and girls of high school age, poor posture, especially when associated with paleness and a loss of appetite, may indicate

illness. Pains in the abdomen are often relieved by pressure secured by bending forward. This act repeated frequently may result in the permanent acquisition of a stoop and the consequent disregard of the original trouble. Defects of posture among children are very frequently the result of diseases of the bones such as "rickets," which, in turn, has been brought on by an unbalanced diet. Among school children, poor posture is frequently induced by eye and ear defects. Failure to hear distinctly with one ear tends to a tilting of the body in the directions from which the sound comes. Poor eyesight usually results in an effort to bring the eyes toward a book rather than in an effort to bring the book toward the eyes. Close attention to the posture of the patient is a distinct aid to the physician in the diagnosis of disease.

20. Bad posture may be the cause of disease. Man, unlike most of the lower animals, walks upright. The normal position of the human body when standing is such that the neck and trunk form a straight vertical line. This position is well illustrated by a drawing prepared by the American Posture League. In this position the organs of the body are not unduly compressed and the nervous and circulatory systems in particular are allowed full play for their functions. In this position, the spinal column, or backbone, supports the head in such a way that one not only looks alert, but feels alert. The head is well balanced and the eyes look straight forward. This point deserves more attention than it usually receives. William James, the celebrated psychologist, believed that posture has a

great deal to do with the emotions; that an attitude of courage, with the head up, chest out, and hand clenched, engenders courage; and that a low, slouching, limp posture engenders cowardice. Moreover, when the body is carried properly, the nerve branches from the brain and the spinal cord are not pinched off or stretched and their function thus interfered with.

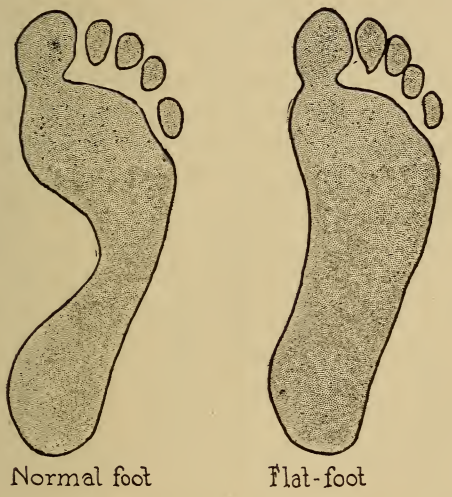


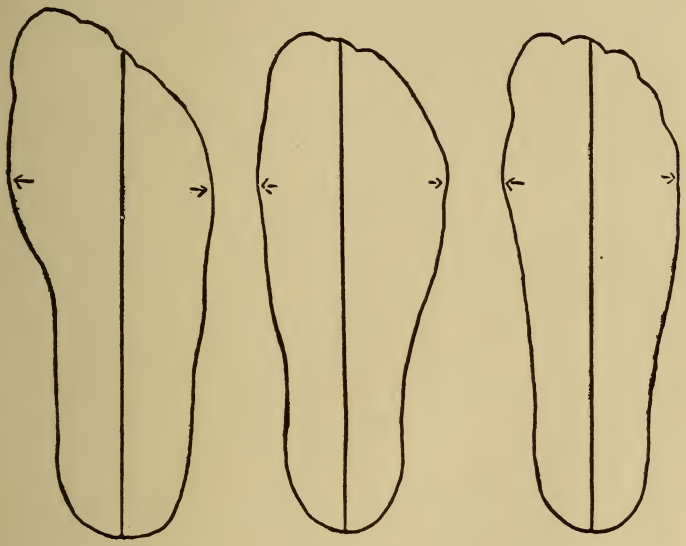
Fig. 20.— Imprint of a normal foot and of one with a fallen arch

The arrangement of the bones of the skeleton is such that, with the body in correct posture, the heart beats freely and the stomach is afforded support so that it does not sag and allow food to stagnate. There is some reason to believe that a habitual stoop leads to tuberculosis. In cases where one shoulder is lower than the other the ribs are crowded together on that side leaving

less space for lung movements and consequently decreasing the amount of air taken into the body. On the side of the high shoulder fresh air does not get up into the top or apex of the lung, a stagnant condition results, and the germs causing consumption multiply rapidly. It is also the experience of physicians that a bending forward of the body crowds the organs of the abdomen downward, and, by pressing these organs against one another, causes a stagnation of food and waste in the bowel, and of blood in some neighboring structures. As a result of this condition, intestinal disturbance known as "constipation, diarrhea, flatulence, (collection of gas), disturbances of circulation, headaches, nervous irritability and, most marked of all, fatigue out of proportion to effort expended, lessen the efficiency of the individual and often make life a burden."

21. **The elements of good posture.** These, so far as they apply to posture while walking or standing, have been mentioned — the neck and trunk form a straight, vertical line. This posture is one requiring of the body the least energy to hold it upright. The American Posture League has found by repeated investigations that "it is also the posture in which the internal organs rest in their natural positions and relations, with adequate room to perform their functions." This same society has also found that "the principles of correct seating require comfortable support of the feet, thighs, and usually of the back, for work or rest, as the case may be. The seat should be of a height to permit the feet to rest comfortably on the floor. The arms should be so modeled as to favor sitting with the pel-

vis as close to the back of the chair as possible; this prevents sliding forward and distributes the pressure properly. The front of the seat should be rounded so as not to press against the legs. The back of the seat should have a slight backward slope and afford support



INFLARED OUTFLARED STRAIGHT

Fig. 21.— The American Posture League, after a very extensive study, has concluded that there are three main types of feet. They are now designing lasts from which shoes of these three types can be made

to the small of the back. Seats modeled along the lines indicated were adopted by the Brooklyn Rapid Transit Company and are now in use in the Brooklyn Subway.

The league has also designed a chair which embodies the desirable points enumerated above. This

chair has been adopted by several communities for school room use and has given great satisfaction.

The American Posture League (1 Madison Ave., N. Y. City) issues a pin for good posture. The design, made especially for the League, shows an American Indian in profile on a small oval. Good Posture Societies should be organized in all schools and these pins can be used for insignia.

22. **Other defects of posture.** Besides the hollow chest, protruding abdomen, and the round shoulders there are defects of the lower extremities, notably flat feet. The service draft examination showed that one person out of every five examined had flat feet. In the normal human foot there is an arch under the instep. This arch is formed by the bones of the foot being drawn upward by muscles and ligaments. If the muscles weaken in any way, the pull on the extremities of the arch decreases and the arch " falls " resulting in a flat foot. The collapse of the bony arch compresses the bloodvessels and nerves under it. In consequence, the circulation of blood is impeded and the pressure on the nerves produces pain which may extend up to the back and abdomen. Many pains thought to be due to diseased kidneys are produced by fallen arches. Fig. 20 shows imprints of a normal foot and one in which the arch has fallen. These imprints may be made by moistening the sole of the foot and then placing it on a dry surface like that of the floor. The arch may be prevented from falling, or fallen arches may be corrected even, by exercises which call for the use of the muscles of the feet; such exercises, for in-

stance, as rising on the toes, with the toes turned inward, and turning on the ankles, both outward and inward.

It has been ascertained by extensive inquiry that there are three main types of feet as shown in Fig. 21. It follows, therefore, that no one type of shoe will fit all feet. Shoes are being constructed over lasts of the three types, designed by the technical committee of the American Posture League. Men and women are learning that more attention must be paid to fitting the shoe to the foot, rather than the fitting of the foot to the shoe. The wearing of improperly fitted shoes results in the formation of blisters, bunions, callouses, " corns," etc. These not only deform the foot and detract from the grace of the body but are often the source of considerable annoyance and pain. A person having defective feet should first secure the services of a chiropodist and afterward wear the proper type of shoe. When the feet pain — for instance from standing and not from any physical defect — putting them in hot or cold water for five or ten minutes at night will often give relief. Persons who walk a great deal on pavements or cement floors should wear rubber heels to lighten the shock.

The wearing of high heels is detrimental to the foot and to the body generally. It causes a pronounced shock to be sent to the spine and brain, resulting in pains in the region of the back and in headaches. The practice cannot be too strongly condemned.

23. **Corrective exercises.** The exercises listed below, prepared by the Physical Training Department of

New York City have been found after extensive experience to be useful in preventing or even correcting defects of posture. Either these exercises or others of a similar nature may well be performed on rising and before retiring and also as a setting up exercise at the beginning of a class room period. Before starting the

Fig. 22.— These seats, designed by the American Posture League, are now in use on the Brooklyn Rapid Transit lines

exercises loosen the clothing as much as possible and open the windows.

1. BREATHING. 4 times.

IN! Six counts for inhalation.

OUT! Four counts for exhalation.

RIGHT (LEFT) :— FACE!

2. Stretching. 4 times.

This exercise must be done to Response Commands, using the cues indicated.

Bend! Bend the trunk forward, touching hands to toes.

Shoulders! Stand erect, touching hands at sides of shoulders in passing to the next position.

Stretch! Stretch the arms upward, palms toward each other. Do not bend backward.

Higher! Make an effort to stretch higher.

Down! Turn hands and bring arms sideways downward quickly, without noise. If the room is too crowded for the sideways downward movement, the arms may be brought down close to the body.

3. Knee Bending. (Thumbs locked behind without command). 8 times.

This exercise should be taught, using the cues indicated; when it is thoroughly learned, it may be done to Rhythmic Commands.

Down! Bend the knees deeply.

Up! Stretch the knees quickly.

Right (Left) :— Face!

4. Breathing. 4 times.

In! Six counts for inhalation.

Out! Four counts for exhalation.

Class :— Sit!

24. Out of door and gymnastic exercise. Every boy and girl should take part in some out of door game and endeavor to become proficient in it. Swimming,

skating, golf, tennis, walking, hunting, and fishing all provide moderate exercise and contact with Nature. In congested cities, opportunities along these lines are limited and recourse should be had to the gymnasium. Gymnastic clubs can develop keen competition, strong bodies and well toned nerves.

25. Athletics. It has been pointed out repeatedly that the remarkable adaptability of the American youth to modern warfare was due largely to his training in athletics. The lessons of courage, resourcefulness, and even chivalry, learned on the ball field, were quickly transferred to the battle field. These qualities made the American fighting man the equal of any the world has ever seen. "We can kill them but we cannot stop them," the Germans are said to have complained. Even in peace times, a sound, athletic body is a very great help to anyone. It makes possible more and better work and encourages a healthy optimistic outlook on life. "Grouches" and "dyspeptics" are not found very often among athletes. Mere muscular strength is not the goal to be aimed at but rather organic vigor together with whatever muscular development may be needed to adapt one to the game or activity in question. Boxing, baseball, basket ball, and football develop these qualities remarkably well. Participation in these games has demonstrated repeatedly that, to be in condition, one must avoid overeating, carousing, smoking, and drinking. A sound mind in a sound body, together with sound morals, make up the perfect American.

There are certain precautions to be taken, however, if one is to take part in athletics. *First,* one should

be examined by a physician. If a defect of any organ is found the physician should indicate the exercise that will correct it, and should give advice as to what forms

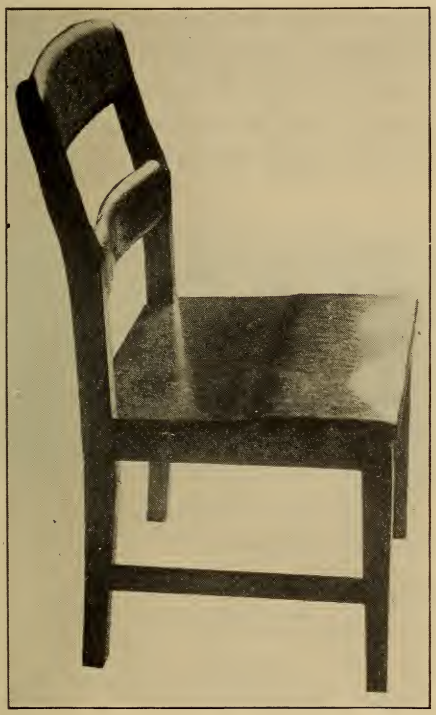


Fig. 23.— Photograph of a chair designed by the American Posture League. What advantages does this chair have over the ones in common use?

of athletics are to be avoided. *Secondly*, it should be kept in mind, as pointed out before, that the development of huge muscles is not what is desired. *Thirdly,*

one should not give up strenuous exercises suddenly. After a dash along the track, the runner should not come to a dead stop at the tape, but should gradually decrease the gait to a walk. This gives the heart a chance to adapt itself to the new condition. *Finally,* after any strenuous exercise, one should bathe in warm water to remove the perspiration and should follow the warm water with cold water in order to close the pores of the skin and send the blood to the interior of the body.

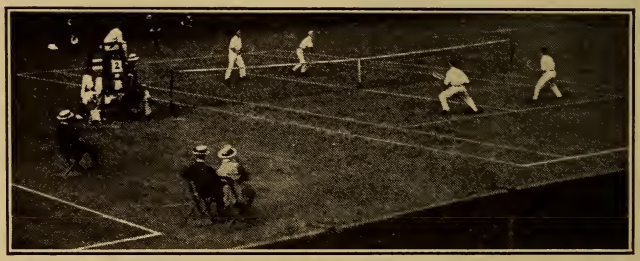


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Fig. 24.— East meets West at tennis

26. Health admonitions from Walter Camp's Instruction Book for the Senior Service Corps.

Warm feet and a cool head need no physician.

A bath, cool if you please, hot if you must, with a good rub, starts the day right.

Dress cool when you walk and warm when you ride.

Wearing the same weight underclothing the year around will save you a lot of colds.

Your nose, not your mouth, was given you to breathe through.

Clean skin, clean socks, clean underwear every day.

Don't sit still with wet feet. Walk until you have a chance to change.

Never let a day pass without covering four miles on foot.

See how high you can hold your head and how deeply you can breathe whenever you are out of doors.

Hot water quick is the best thing for a sprain.

Short shoes and shoes that don't fit cost a lot in the long run.

Getting mad makes black marks on the health.

Envy, jealousy, and wrath will ruin any digestion.

When you rob the trolley company of a nickel by walking, you add a dime to your deposit of health.

You'll never get the gout from walking.

Sleep woos the physically tired man; she flouts the mentally exhausted.

The best record in golf is the record it has made of restored health to the middle-aged.

Tennis up to the thirties, but golf after forty.

Nature never punished a man for getting his legs tired. She has punished many for getting their nerves exhausted.

Two hours of oudoor exercise by the master never yet made him over critical of the cook.

Don't ask the heart to pump extra blood to the brain all day and then to an overloaded stomach all night.

Tight shoes have sent many a man to bed with a cold.

Leg weariness never yet produced brain fag.

Loose clothes, loose gloves, easy shoes spell comfort and health.

No wise athlete stands still after exercise without putting something over him.

Open windows don't make half as many colds as closed ones do.

Blood pressure does not come to the men who walk a lot out of doors; instead it looks for those who sit and eat a lot indoors.

Many a man finds too late that his motor car has cost him more in health and legs than it has in tires and gasoline.

Fig. 25.— Championship game of baseball

A four or five-mile walk daily makes your credit at the bank of health mount up steadily.

Nature won't stand for overdrafts any more than your bank.

The men who chase the golf ball don't have to pursue the doctor.

CHAPTER IV

AIR AND BREATHING

27. What contact with air does for the body. Many persons think that the only use for air is for breathing, and that the only use for water is for drinking. They have not learned what physicians have found, that mere contact with air and water have a very decided effect in keeping the body in a healthy condition and even in restoring it to health when it has been invaded by disease. So true is this that one of the most successful forms of treatment for consumption and nervous diseases in children consists in allowing the children to romp and play, attired only in as much clothing as decency requires. The healthy response which the body shows to this form of treatment is remarkable and its full explanation is not known.

It is a matter of common observation that persons living out of doors have a healthier complexion and are more energetic than those living indoors. This is, of course, explained partly by the beneficial action of sunlight on the body and partly by the increased muscular action induced by the out of doors. A change of air temperature, either from the day to the night or from summer to winter, is probably best suited to the

healthy functioning of the body. Every one should take full advantage of fresh, cool air, particularly those suffering from any wasting disease or from any disease of the nervous system which may be produced by overwork or worry.

28. How and why we breathe. Our bodies are in some respects like steam engines. For instance, they require fuel. A steam engine drawing a train of cars has to be kept constantly supplied with coal. If the fire box of the engine is not sufficiently supplied with

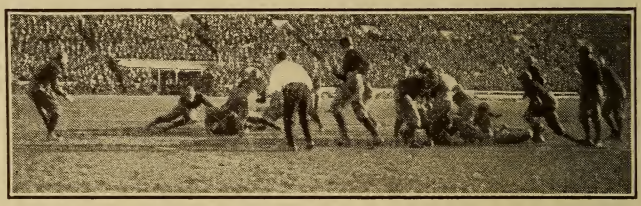
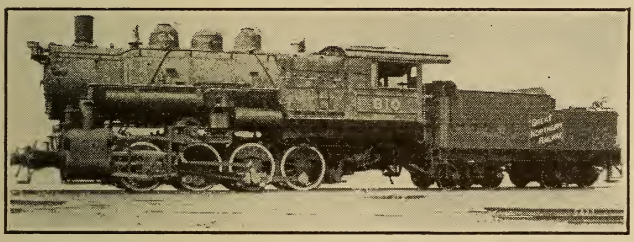


Fig. 26.— East meets West at football
(Harvard vs. Michigan)

this fuel, it is unable to perform the work that is necessary to draw such a heavy load. We need to work just as much as an engine does. An engine that cannot perform work is useless, and so is a human body. To perform work our bodies must have fuel in the form which they can use; for instance, bread, potatoes, meat, and milk. But every one has noticed that, in order to have fuel burn in a stove or fireplace, it is necessary to have the dampers open so that a draft or current of air may come in contact with the fuel. If for any reason sufficient air does not pass through the fuel, the fire

burns down. In like manner, our food will not be burned and we will not be provided with heat and power to work, unless our bodies are supplied with a constant stream of air. We are all conscious of breathing — we have noticed the nostrils dilate. the chest rise and fall, and we have felt the passage of air through the mouth or nose, the back part of the throat, and down into the chest. Most persons know that they have lungs but few could describe them.

The best way to get an idea of what the lungs look



Photograph from Underwood & Underwood

Fig. 27.— What is the source of the energy used by this engine?

like is to ask a butcher to show you the "pluck" of a calf. This consists of the windpipe, which conducts the air down from the throat, the two lungs, and between the lungs, the heart. An examination of the lungs will show them to be pinkish in color, due to the presence of blood, and very compressible. If one takes a pocket knife and slits open the windpipe and then follows it down into the lungs he will find that it divides into two main branches, one going to each lung. Each subdivides, and these subdivisions finally end in

the spongy tissue of which the lung is composed. This spongy lung-tissue is easily compressed by the muscles

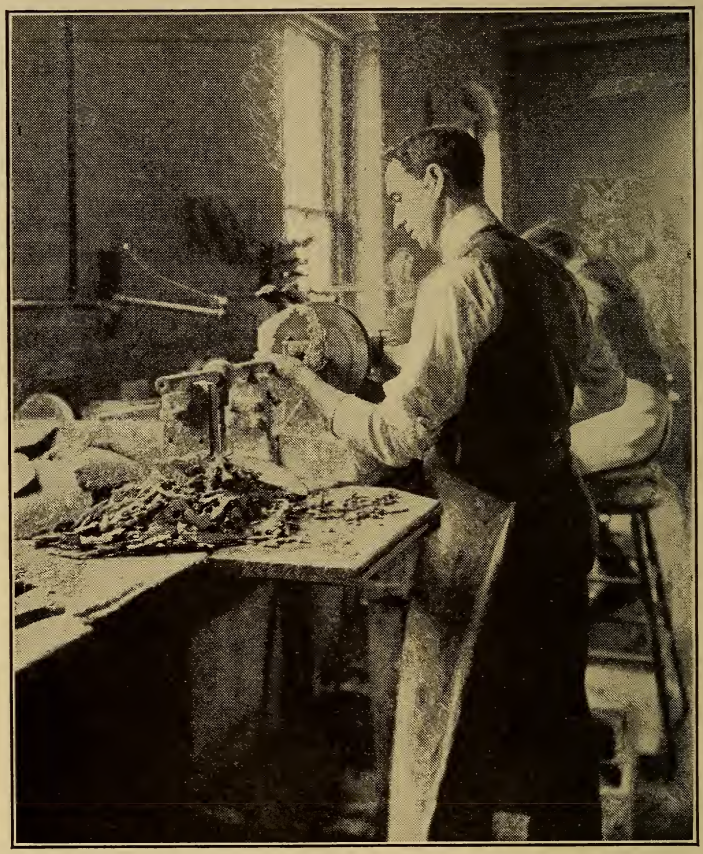


Fig. 28.— Showing workmen cutting pearl shell unprotected from the excessive and dangerous dust

and ribs in the chest wall; but when the pressure is released the lung returns to its normal expanded position

and sucks in air from the outside through the windpipe, mouth, and nose. When the air reaches the lung-tissue it almost comes in contact with the blood, giving to the blood a remarkable substance, oxygen, which has the faculty of enabling fuel to burn. The blood in return for the oxygen, gives back to the air waste products — carbon dioxide and water, which are likewise formed when coal or wood burns. When the chest "falls" during breathing the wall of the chest compresses the lungs, and the air containing carbon dioxide is forced out along the same path taken by the incoming current of air.

29. What we breathe. We are all acquainted with the fact that we breathe air. But not every one knows what air is. Of course we know that it is a gaseous substance, colorless, and that it flows about readily from one place to another. It is constantly in motion as we are aware from our experiences with "drafts" and "winds." But yet what is air? Chemists have found that it is made up principally of gases, and biologists have found floating about in it other substances — some dead, some living, and still others which never had life. Two of the gaseous substances composing the air, we have already mentioned, oxygen and carbon dioxide, but these exist in relatively small amounts as is seen from the following table:

Air that we breathe in		*Air that we breathe out*	
Oxygen	20.96%	Oxygen	16.4%
Nitrogen	79.00%	Nitrogen	79.5%
Carbon dioxide	0.04%	Carbon dioxide	4.1%

Among the dead substances floating about in the air are particles formed from the bodies of plants and ani-

mals during decomposition. Among the substances which never had life are particles of steel and stone, which often get into our eyes. The living substances are bacteria, spores of molds, and pollen grains. The living bodies found in the air are particularly interesting because some of them cause disease. The mold spores are seeds of the mold which we see growing on stale bread, apple cores, etc. These spores are blown about by the currents of air and sometimes lodge in the ear or nose where they may grow and produce disease. Expose a piece of moist bread, a moist apple core or a moist banana peel to the air for an hour and then put them under a cup to see how many kinds of molds you can raise. Bacteria, together with certain kinds of one-celled animals, are commonly called "germs" They are so small that they can be seen only with the aid of a microscope, and yet they kill thousands of people each day, either by secreting poisons in them or by actually eating the tissues of their bodies. One form of bacteria, in particular, thrives in the soft spongy tissue of the lung, consuming it and producing a disease which we call consumption. As the germ causing this disease eats away more and more of the lung-tissue, less and less oxygen can be taken up by the blood. At the same time that it is consuming the lung-tissue, it is secreting a poisonous substance which is taken up by the blood and distributed throughout the body, causing a loss of vitality and weight. We should be constantly the prey of the tuberculosis bacteria if it were not for certain safeguards which Nature has thrown about us. First, there are the hairs in the nos-

trils which act as a sieve, straining out particles of dirt and bacteria; there is also the slimy mucous secretion of the nostrils, which catches many more invaders; finally the tissues of the lungs are able to offer what is called "resistance" to the disease germs, if the body has plenty of nourishing food and is given the required

Fig. 29.— Showing how workers in the process of casting brass are protected against zinc fumes

amount of rest, sleep, and exercise. The importance of breathing through the nose rather than through the mouth lies in the fact that the nostrils not only prevent much of the dust from reaching the lungs but they also warm the air before it reaches the throat and lungs. For this reason it is necessary to have the nostrils well cleared so that nose breathing will be as easy

as mouth breathing and far more healthful. There are persons, to be sure, particularly in damp climates, who fall victims to consumption in spite of the best medical care. Some of these persons, at least, have inherited weak constitutions, or at least weak lungs, and thus start out in life at a disadvantage.

30. Diseases of the breathing organs. Physicians who have had years of experience in conducting "autopsies," or examinations of dead bodies, say that almost every one has consumption at some time or other during his life. They know this from "scars" left by the disease in the lungs. If a person keeps himself in good condition his body is able to resist the disease successfully. So great is the danger from this disease that each one should know just what to do to avoid it and what to do to combat it. Mention was made in the preceding paragraphs of the tendency to tuberculosis in damp climates. This same tendency is found in damp communities and in damp houses. The tendency is found among those who live indoors a great deal, particularly among those who inhale large quantities of dust, as men do who work in close, ill-ventilated rooms, or in rooms where marble or wood is being polished. It is found among those who overwork or under-exercise; among those who worry or grieve; in a word among those who do not live out under the blue dome of Heaven, as God intended that they should. It is, of course, impossible in our present "civilization" for every one to do this — we need office workers as well as field workers. But those who work inside, either through choice or necessity, must guard well

their health. They should ventilate their work-rooms as well as the construction will allow. If the room itself is not adapted for good ventilation, complaint should be made to the employer or to the Board of Health. Workers have tolerated bad working conditions too long, and one of the greatest services that can

Fig. 30.— Women at work on small cores in a well lighted, well ventilated and well kept foundry

be done for a community is for students in hygiene classes to call attention to these facts through the press or by personal interviews with the Health authorities.

The question now arises, if tuberculosis or consumption is so general, how is one to recognize it? At one time it was very difficult to recognize the disease in its early stages but now, with more refined methods of

diagnosis, particularly by the use of the X-ray, physicians are able to distinguish the disease at a very early date. It usually causes a loss of energy, loss of weight, a cough, and sometimes night sweating. If a person is aware of any combination of these symptoms, it would be well to consult a physician immediately. The disease is not hopeless as many think; as a matter of fact, one of the greatest monuments erected to the memory of the hundreds of self-sacrificing physicians who have studied this disease is the successful treatment which they have devised for it. A hundred years ago the disease was called the "Great White Plague," and its victims considered themselves doomed to a speedy death. Now, however, if the consumptive begins in time, he can defeat the disease and restore himself to normal health by a well-regulated diet and hygienic conditions of living.

Out-of-door living plays a great part in the treatment. In the first paragraph of this chapter there was described a new form of treatment for tuberculosis in children by means of air baths. The knowledge of this form of treatment should be more general, and recourse should be had to it whenever circumstances permit. Fresh air, both by day and night, and plenty of nourishing food furnish the key to the cure.

The question of foods and dietaries form the subject of a subsequent chapter, but one should note here that certain foods like eggs, milk, cooked and uncooked cereals, and coarse bread should form the basis of the diet. Fats and oils are particularly nourishing to those suffering from respiratory diseases. It seems impossible

for one to overeat during the course of the disease, though one may overwork. Rest, or at the most, light out-of-door work is essential, in order that no new strain may be put on the body. And the best rest is that which is taken in contact with fresh, cool air. Fortunately the prejudice against night air is disappearing.

Fig. 31.—A disciple of Dr. Trudeau

The coolness of the night air makes it especially useful in the treatment of consumption. Of course, if the air is cold, the body should be guarded against chills by proper street and bed clothing. People thought that Dr. Trudeau was crazy when he took his tubercular patients to winter in the Adirondacks, where snow lies on the ground six months in the year and the temperature

often goes as low as 30 degrees below zero. But the patients got well, and now Dr. Trudeau is known as the "Beloved Physician," and a town is named in his honor. Boards of Health are always ready to coöperate in an endeavor to check this disease and will give the best medical advice, and often complete treatment, free of charge, to those who need and desire it. In the larger cities well equipped clinics for diagnosis, and complete sanataria for treatment are provided.

Another disease of the lungs which causes thousands of deaths is pneumonia. People make themselves susceptible to the disease by over-eating, overworking, over-exposure to cold winds, by going about with wet feet, and by neglecting colds. Pneumonia shows itself by symptoms of fatigue, chills, fever, and a loss of appetite. The disease develops so rapidly that it is always best, when these symptoms are present, to call a physician. Certain first aid measures should be taken while awaiting the physician's call. First, one should take a physic and put the feet in hot mustard water (one tablespoonful of mustard to a gallon of water). Immediately afterward, one should go to bed and, while keeping well covered, drink a bowl of lemonade as hot as it can be taken. If pains in the chest are present, the physician will probably recommend a mustard or flax seed poultice; the use of these, therefore, may be anticipated. Directions for making the poultices are given in Chapter XIII. The directions given above apply equally well to ordinary colds, grippe, or influenza.

31. Problems of ventilation. So much of what has been said about air and the diseases of the breathing

organs is involved in methods of ventilating that it seems well to summarize here. Ventilation means providing the body with currents of air. It used to be supposed that ventilation was necessary because of the collection of waste products in the air which came from the lungs, and because of the exhaustion of the oxy-

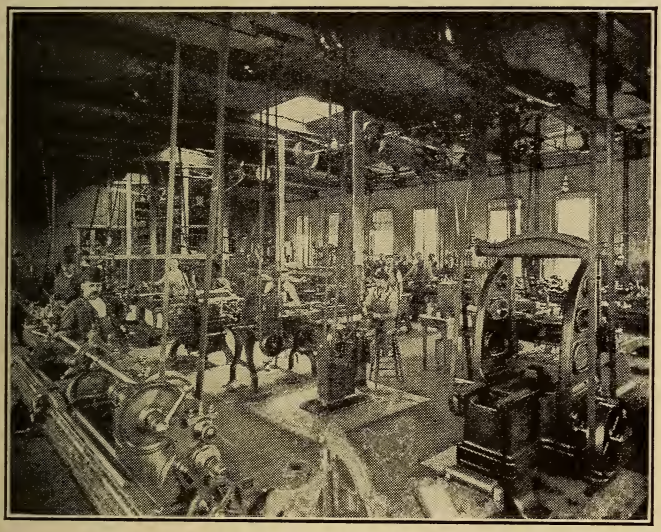


Fig. 32.— A well lighted workroom having whitened walls, prismatic glass kept clean and shades for windows

gen from the air of the room. It is known now, however, that it is not possible to reduce the oxygen supply in a room to the danger point by breathing and that the ill effect of carbon dioxide is negligible. What the body needs most of all is a current of fresh, cool air, containing a small amount of moisture. It is be-

cause of this fact that we should keep out in the air as much as possible during the day and that we should ventilate our living rooms day and night by having the windows open top and bottom. Rooms ventilated by keeping the windows in this condition will enable one to work better and sleep better, since there will be a constant stream of fresh air into the room, by way of the lower part of the window, and a constant stream of

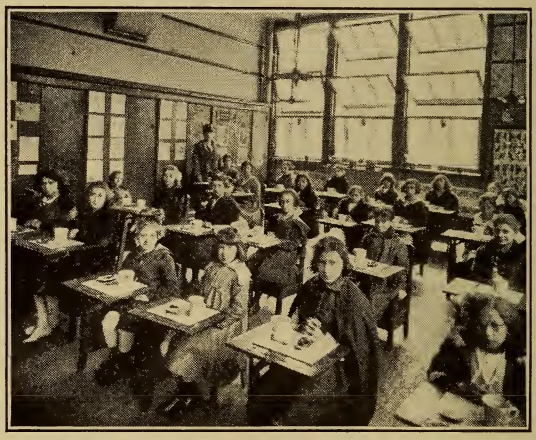


Fig. 33.— A well ventilated schoolrooom

heated and vitiated air out, by way of the top of the window. If the draft produced by opening the window in this way is too severe, a wooden frame, covered with cheese cloth and fitted into the bottom of the window, will moderate the air current.

As an example of the disastrous effects of a failure to ventilate, the experience of the British soldiers locked in the Black Hole of Calcutta may be cited. About

150 soldiers were confined, during a hot tropical night, in a room about 20 feet square, provided with only two windows, both on the same side of the room. In the morning twenty-three were found alive! This incident has given rise to many theories as to the cause of death. There may have been a shortage of oxygen and an accumulation of carbon dioxide and other poisonous waste products. That these do not constitute the immediate cause of the loss of 127 lives in one night is the prevailing opinion of specialists on ventilation. The real cause of the disaster was probably the rise in the temperature, due to the presence of so many human beings closely confined in a small room. As the temperature rose, the living conditions became more unbearable and the movements of the agonized prisoners rendered the situation increasingly acute.

CHAPTER V

FOOD AND DIET

32. The body considered as an engine. It will help us to understand how the human body performs its work if we consider first a steam engine. It may seem at first thought that there is little resemblance between the two, but yet they bear to one another a very profound likeness. In the first place, both move and both do work. A steam engine, if hitched to a car, can pull it, and a man, if hitched to a smaller car, can pull that also. Where do they get this ability to do work? Since the engine is much the simpler structure of the two, we will consider that first. If you watch a steam engine as it comes into a railroad station, you notice that there are two men in it — an engineer, to start and direct it, and a fireman, to supply it with coal. What happens to the coal? If you watch the fireman, you notice that he shovels the coal into a fire box, where it burns. But how does this run the engine? If you ask the fireman, he will show you that the fire box is under a great tank of water. You know what happens to a kettle of water when it is put on a hot stove. When the water boils, the cover of the kettle moves up and down, due to the pressure of steam within. A similar change takes place in the engine. The heat of the burning coal changes the water into steam, and the steam

moves the piston rod up and down, and the piston rod moving up and down moves the wheels around, and so the engine is able to do work. In other words, from the burning coal comes heat energy and motion energy. So in our own bodies, food is burned from which we obtain heat and motion energy. A starving person has little vitality and does not move about much as only a small portion of fuel is being burned in his body. On the other hand, during some diseases such as influenza,

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Fig. 34.— Potato farming — potatoes are a valuable food

fuel is burned too fast, and the person's temperature rises, causing what is called a "fever." At other times in the same disease, too little fuel may be burned, so that the person suffers from a lowered temperature or "chill." The temperature of the human body is normally about 98.6° F. This is maintained in several different ways among which are sweating, shivering, and drinking hot or cold liquids. If there is a tendency

for the temperature to rise, the body gives off sweat, which evaporates on the skin, thus cooling the body. If there is a tendency for the temperature to fall the body resorts to shivering, which is a very effective means of generating heat. In disease, it is frequently necessary to produce sweating by hot drinks, such as hot lemonade, or to give hot baths. On the other hand in chills,

Fig. 35.— Rice farming — Transplanting rice shoots, near Kyoto, Japan

it may be necessary to wrap the patient up warm and to apply hot flannels or hot water bottles in addition to giving hot drinks frequently.

33. Food as fuel. Not all things that burn are suitable for fuel either for the steam engine or for the human body. For instance, the ordinary steam engine is not constructed so that it can utilize kerosene or gasoline, and yet both burn. So with the human body.

Substances which can be utilized by the human body as fuel or for repair or regulation are known as *foods*. We will first consider those foods which serve as fuel. In general, they are the starchy, sugary, and oily foods. Under this head would come bread, potatoes, honey, and bacon. The Life Extension Institute of New York City, of which Ex-President Taft is Chairman of the Board of Directors, has compiled in its booklet called

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Fig. 36.— Threshing wheat

"Food — Fuel for the Human Machine," a list of fuel foods divided into three classes and arranged in such an order that those coming first are the ones giving the most energy for the money.

1. Starchy Foods	2. Sugars	3. Fats
Cornmeal	Sugar	Drippings
Hominy	Corn Syrup	Lard
Broken rice	Dates	Salt pork

1. Starchy Foods	2. Sugars	3. Fats
Oatmeal	Candy	Oleomargarine
Flour	Molasses	Nut margarine
Rice	Most fruits	Peanut butter
Macaroni		Milk
Spaghetti		Bacon
Cornstarch		Butter
Dried lima beans		Cream
Split peas, yellow		
Dried navy beans		
Bread		
Potatoes		
Bananas		

These foods, when used in moderation, are burned in the body and release heat and work energy. Where does the burning take place? We learned in an earlier chapter that the leaf of the lily is composed of tiny structures called cells. The same is true of a human body. Every organ and tissue of the body is made up of cells. It is in these cells that the food is burned, being carried there by the blood stream. Each cell is like the fire box of the engine since it is the place where the chemical energy of the food is changed, by burning, into heat and work energy.

A word of caution should be given here in regard to the danger of taking into the body too much starchy and sugary food. Starch is digested into sugar, which, together with the sugar contained in puddings, candies, ice cream etc., is stored in the liver, from which it is *gradually* given to the blood to be fed to the cells. The amount of sugar normally present in the blood at any one time is very small — less than one per cent. But under the constant bombardment of sugar-containing foods, the sugar content of the blood may rise

much higher than that, and sugar in large quantities is a poison. Mr. Alfred McCann, Food Expert for the New York Globe, says that "America has become a nation of refined sugar hogs." He says that "the aver-

Photograph by Underwood & Underwood

Fig. 37.— Cabbages are a valuable and inexpensive food

age annual consumption of refined sugars in the United States is at least one hundred and fifty pounds per person. The figures of the Department of Commerce show that, in Germany, the consumption is sixteen

pounds; in France, twenty-eight pounds; and in Great Britain, thirty pounds." In other words the average American consumes five times as much sugar as his nearest competitor. Mr. McCann says in this connection, that "the last generation has recorded a fifty per cent. increase in diabetic affections." Diabetes indicates a dangerous condition characterized by an abnormal amount of sugar in the blood, which acts as a poison, it being an alcohol, and produces drowsiness or,

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Fig. 38.— Harvesting Onions

if not corrected, unconsciousness. Fortunately diabetes can be controlled by limiting the amounts of starch and sugary foods taken into the body.

34. Food as a tissue builder. When a portion of an engine becomes worn out, it has to be replaced by a new part. In the human body, cells are continually being worn out and new cells have to be built to replace them. During the period of growth, when the human body is constantly increasing in size, millions

of new cells are being formed. Where do the materials for the new cells come from? We know that in the case of the engine the machine cannot repair itself or grow. But not so with the human body. The human organism, like every other living thing, is able to increase its own structure up to a certain limit and also,

Fig. 39.— Fresh fruit should be a part of every diet

within certain limits, repair worn out and diseased parts. We know, for instance, that when the hand is cut or torn, the surrounding flesh is able to fill in the wound with new cells and tissues, until a *scar* is all that remains of the original wound. It is almost in-

credible to be told that a machine can repair itself, but we have the evidence here. And not only can the machine do this, but it procures material for the process by its own exertions. This material we get in our food. Not all food can be used as building material, just as not all food can be used as fuel. Foods that can be used for this purpose are lean meat, eggs, fish, cheese, peas and beans. They all contain a substance or *nutrient,* called protein, out of which new *living material* or *protoplasm* can be made. Certain parts of our bodies, as for instance the bones, are reinforced by mineral substances such as lime. Consequently, foods containing lime must be eaten. Cereals and milk are examples of these foods.

The Life Extension Institute, in the booklet referred to in the preceding paragraph, provides the following list of protein-containing foods in the order of their cost. Those giving most building and repair value for the money head the list.

Beans (dried white)	Peanuts
Dried Peas	Macaroni
Oatmeal	Mutton, Leg
Cornmeal	Beef, Lean rump
Beans, dried lima	Milk
Bread	Beef, Lean round
Bread, whole wheat	Lamb, Leg
Bread, Graham	Eggs
Salt Cod	Halibut
Milk, skimmed	Porterhouse steak
Cheese (American)	Almonds, shelled

The second kind of building material includes a variety of minerals which help to make bones, blood, and other body parts. They are found chiefly in milk, cereal foods (when made from whole grains), fruits, and vegetables. Of these minerals, lime, iron, and phosphorus are especially needed to keep the body in

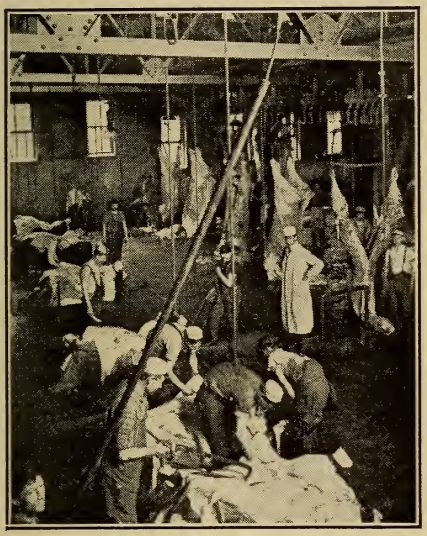

Fig. 40.— Dressing beef for market

healthy condition. In a diet that daily includes milk, green vegetables, fruit, and cereals made from whole grains (oatmeal, flaked wheat, wheatena, etc.) there is little danger of mineral starvation. Where the diet is very limited, with white flour, fats, and sugar forming the chief foods, there is much danger. A pint of

milk a day is the best insurance against lime and phosphorus lack. Cereals, fruits, and green vegetables will furnish iron, and may be supplemented by eggs (especially yolks) and meat for this purpose.

Although the primary use of protein is for tissue building, it can be used for fuel, inasmuch as it will burn. It does not, however, burn as well or as completely as the starches and sugars (carbohydrates). This can be made clear by a reference to the chemical composition of the two kinds of foods. Carbohydrates — starch and sugar — are made of carbon, hydrogen, and oxygen. When the sugar is burned, carbon dioxide and water are formed, one being a gas, the other a liquid. Protein, on the other hand, contains nitrogen in addition and consequently, when it is burned, a waste product containing nitrogen is formed. This substance is *urea* and may be compared to the ashes or clinkers that collect on the grating of a stove. When the coal and wood are burned, the carbon dioxide and water formed pass into the air, but the part that is not capable of burning collects on the grate and has to be removed from time to time. It is not advisable, therefore, to attempt to supply the fuel needs of the body by using protein. Protein should be eaten sparingly. Girls and women are apt to eat too much sugary foods; men and boys too much protein — principally meats. A safe rule to follow is —"Meat should not be eaten more than once a day." Inasmuch as most foods contain some protein, the building material needed by the body can be obtained from whole wheat bread, milk, and cereals. It is to be noted also that, while the body

needs protein, it also needs different kinds of protein. The protein of vegetables is different from that of meat, and that of milk is different from that of eggs. The same point applies to sugars and fats. We should endeavor therefore to give the body variety. A person

Fig. 41.— Explorers in the far North or South find it necessary to eat much fat. Why?

who cannot tolerate ordinary desserts can frequently take honey or brown sugar or pure maple sugar, and in like manner, one who would be poisoned by the proteins of meats may be able to utilize the proteins of vegetables.

35. Body fat. Just as a prudent man lays aside money to be used for emergencies so the body stores,

in the form of fat, some of the excess of food taken into it. This serves the purpose of filling out the frame of the body, of providing a soft oily padding for muscles, bones, and organs, and also of providing a reserve supply of food to be drawn on in case of need. The bodies of even the most spare of men contain some of this body fat. It is found in small quantities even in the tissues of persons who have been much emaciated by tuberculosis. There is no constant relation between the weight and size of a person and the amount of food the body may require. Some very thin individuals eat more than stout ones, but the food is burned almost immediately. On the other hand, a very stout person may eat little and yet may keep the same weight — much of the food being changed to fat instead of being burned. Sugars and starches are most easily made over into body fat; after these, fats; and least easily, proteins. Consequently, a person who is over stout should eat a minimum of fat-producing foods; one who is too spare may be made to fill out by eating milk, eggs, and cereals.

Diets too frequently lack fats and oils. It is a mistake to trim the fat from ham, beef, or mutton and to throw away bacon gravy and drippings, unless a person is poisoned by them. The body needs these substances in good variety. A salad made of lettuce or other leaves bathed in olive oil, to which a little lemon juice may be added, is very nutritious. The fat yielded by meats — called drippings — should be kept and used for shortening in the making of cakes, pies, and cookies.

36. Regulating substances. In addition to those

substances which build up the body tissues and which yield fuel for the production of heat and work energy, there are substances which regulate the intricate machinery of the body. These are (a) water, (b) mineral substances, (c) bulky or fibrous foods, (d) hard foods, and (e) vitamines. The body needs large quantities of pure water. It serves to dissolve the digested foods, to make blood and protoplasm, and to carry away

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Fig. 42.— Vegetables are rich in regulating substances

waste substances from the tissues. Some physicians who have given considerable attention to the subject say that the body needs from six to eight glasses of water a day. Water also introduces into the body valuable mineral substances. Some of these, like lime and phosphorous, may also be obtained from milk, eggs, and cereals. They are particularly important as bone-building material. Children from whose diet

these foods are lacking grow up with soft bones and, as a result, bone deformities, especially of the legs, develop. Of the mineral substances iron is one of the most important. So important is it that medical fakers, playing upon the sympathies of the public, have made millions of dollars from remedies containing, or said to contain, iron. Iron is necessary for the manufacture of good rich blood. The redness of the blood is due to the combination of oxygen from the air with an iron

Fig. 43.— A suburban vegetable garden

compound made in the body called haemoglobin. It has been discovered by chemists that the composition of haemoglobin is very much like that of the green coloring matter of plants, and that iron, while it may not be present as a constituent of the green coloring substance, is present in other parts of the plant cells. It is simpler, cheaper, and more efficacious to supply the blood with iron through the medium of green vegetables like spinach, dandelions, cabbage, lettuce, and beet greens, than through the medium of the various

" tonics " and " rejuvenators " advocated by the patent medicine press. Fresh vegetables and fresh air are very nearly the key to health. The vegetables, in addition to supplying very valuable mineral substances, provide the body with indigestible fibrous material which prevents the solid waste material from clogging the bowel. Cereals are, therefore, to be preferred to cathartics! Each table should provide, once or twice a day, foods from the following list:

graham or whole wheat bread
bran muffins, bran cookies, and bran breakfast foods
potatoes (boiled or baked) eaten with the skins
cabbage (those who cannot eat fresh cabbage may be able to eat sauerkraut)
turnips
carrots
celery
spinach
onions (raw, boiled, or baked)
lettuce
parsnips
apples (eaten with skins on)
prunes
figs

Of the cereals, those containing " bran " are the best for a regular diet. Bran is the coat of the grain and is largely indigestible, although containing in small amounts some very valuable mineral constituents needed by the body. Bran should be in every pantry or kitchen. If oatmeal is used, a tablespoonful of bran

can very well be added to the oatmeal before it is cooked, or a teaspoonful can be sprinkled on each plate of oatmeal before it is served. It is well to cook cereals the night before they are to be used and to warm them for breakfast, or at least to soak them over night. In this way the grain is made more digestible. Kipling remarked, "compressed vegetables and meat biscuits may be nourishing — but what Tommy Atkins needs is bulk in his inside."

In addition to foods which owe their bulk to a fi-

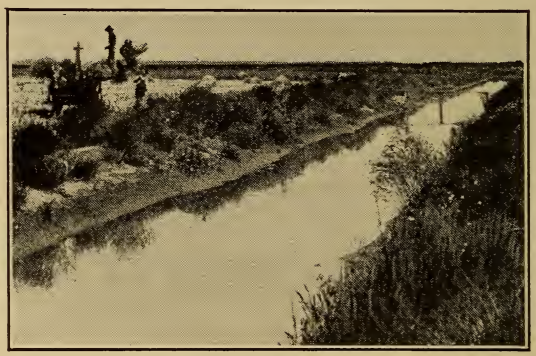

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Fig. 44.— A rice field in Texas

brous content, there are some foods which may be termed hard, such as stale bread and zweiback. These foods are particularly good for the teeth and for stimulating the digestive processes. The tiny particles composing a crust of bread rub up and down on the surface of the teeth like so many little brushes, wiping away the slimy coating and the particles of soft food which may have clung there. In addition, the chew-

ing of hard foods strengthens the muscles of the jaw, increases the circulation in the gums, and improves the tone of the whole body.

It has been a common fallacy to consider foods and diets in terms of fuel and tissue value. As a matter of fact, if a person attempted to live on a diet made up with these factors only in view, he would soon find it insufficient. There are in the coatings of grain, in raw milk, in butter, and in the yolk of eggs, substances which cannot be detected chemically, but which exert a very profound influence in the body. Their presence is recognized by the fact that when they are absent from a diet, disturbances of the body functions result. They are called *accessory substances,* or *vitamines.* Their absence from the diet of the Japanese soldiers during the Russo-Japanese War produced a severe nervous disease called beri-beri; their absence during the long voyages of the Cape Cod whalers produced scurvy; and their absence from the diet of people in certain parts of Italy and of the southern parts of the United States may be the cause of pellagra. Animals in zoölogical gardens become diseased if they are fed raw meat without a bone attached, but they soon become well again if given large bones which they can gnaw. The authorities responsible for the health of the British Navy have discovered that the dried and canned food given to the sailors will produce scurvy. This can be cured or prevented by the addition of fresh lemon or lime juice to the diet. Consequently British sailors are familiarly known as "limies." One British naval administration attempted to substitute for the juice of

the fresh limes and lemons an artificial product but soon learned that the vitamines present in the fresh fruit are lacking in the artificial variety.

Beri-beri is a curious disorder found among the Filipinos, Japanese, and the nations of East India. It begins with a feeling of lassitude and pains in the legs; later the patient becomes unable to walk, breathing becomes difficult, and palpitation of the heart follows. It is a disease which affects the nerves particularly. If fowls are fed exclusively polished rice, that is, rice which has had the outer coat removed, no changes are noticeable for several weeks, but suddenly they become unable to walk, and die in a short time if the diet is not changed. If, however, unpolished rice is fed, the fowls recover. Evidently something is present in the coat of the rice which is needed by the body and which must be present in very small amounts.

Pellagra resembles beri-beri in some respects. The skin on the backs of the hands and about the neck becomes thickened and rough. Nervous disturbances are prominent. The disease occurs among people who live on a very restricted diet.

Scurvy was very common in the past when vegetables were rare, and salted or otherwise preserved meat was eaten in quantities. It is not known what particular substances are responsible for it, but it can be prevented by eating the juices of limes, oranges, or lemons. Among children, an exclusive diet of boiled or sterilized milk sometimes produces scurvy. Orange juice appears to prevent this.

37. Summary. We have learned, up to this point,

HEIGHT and WEIGHT TABLE for GIRLS

Hgt: Ins:	5 Yrs.	6 Yrs.	7 Yrs.	8 Yrs.	9 Yrs.	10 Yrs.	11 Yrs.	12 Yrs.	13 Yrs.	14 Yrs.	15 Yrs.	16 Yrs.	17 Yrs.	18 Yrs.
39	34	35	36	...	...	...	...	...	...	...	...	...	...	...
40	36	37	38	...	...	...	...	...	...	...	...	...	...	...
41	38	39	40	...	...	...	...	...	...	...	...	...	...	...
42	40	41	42	43	...	...	...	...	...	...	...	...	...	...
43	42	42	43	44	...	...	...	...	...	...	...	...	...	...
44	44	45	45	46	...	...	...	...	...	...	...	...	...	...
45	46	47	47	48	49	...	...	...	...	...	...	...	...	...
46	48	48	49	50	51	...	...	...	...	...	...	...	...	...
47	...	49	50	51	52	53	...	...	...	...	...	...	...	...
48	...	51	52	53	54	55	56	...	...	...	...	...	...	...
49	...	53	54	55	56	57	58	...	...	...	...	...	...	...
50	...	...	56	57	58	59	60	61	...	...	...	...	...	...
51	...	...	59	60	61	62	63	64	...	...	...	...	...	...
52	...	...	62	63	64	65	66	67	...	...	...	...	...	...
53	...	...	...	66	67	68	68	69	70	...	...	...	...	...
54				68	69	70	71	72	73					

HEIGHT and WEIGHT TABLE for BOYS

Hgt: Ins:	5 Yrs.	6 Yrs.	7 Yrs.	8 Yrs.	9 Yrs.	10 Yrs.	11 Yrs.	12 Yrs.	13 Yrs.	14 Yrs.	15 Yrs.	16 Yrs.	17 Yrs.	18 Yrs.
39	35	36	37	...	...	...	...	...	...	...	...	...	...	...
40	37	38	39	...	...	...	...	...	...	...	...	...	...	...
41	39	40	41	...	...	...	...	...	...	...	...	...	...	...
42	41	42	43	44	...	...	...	...	...	...	...	...	...	...
43	43	44	45	46	...	...	...	...	...	...	...	...	...	...
44	45	46	46	47	...	...	...	...	...	...	...	...	...	...
45	47	47	48	48	49	...	...	...	...	...	...	...	...	...
46	48	49	50	50	51	...	...	...	...	...	...	...	...	...
47	...	51	52	52	53	54	...	...	...	...	...	...	...	...
48	...	53	54	55	55	56	57	...	...	...	...	...	...	...
49	...	55	56	57	58	58	59	...	...	...	...	...	...	...
50	...	...	58	59	60	60	61	62	...	...	...	...	...	...
51	...	...	60	61	62	63	64	65	...	...	...	...	...	...
52	...	...	62	63	64	65	67	68	...	...	...	...	...	...
53	...	...	...	66	67	68	69	70	71	...	...	...	...	...
54	...	...	...	69	70	71	72	73	74	...	...	...	...	...
55	...	...	...	...	73	74	75	76	77	78	...	...	...	...
56	...	...	...	...	77	78	79	80	81	82	...	...	...	...
57	...	...	...	...	...	81	82	83	84	85	86	...	...	...
58	...	...	...	...	...	84	85	86	87	88	90	91	...	...
59	...	...	...	...	...	87	88	89	90	92	94	96	97	...
60	...	...	...	...	...	91	92	93	94	97	99	101	102	...
61	...	...	...	...	...	...	95	97	99	102	104	106	108	110
62	...	...	...	...	...	...	100	102	104	106	109	111	113	116
63	...	...	...	...	...	...	105	107	109	111	114	115	117	119
64	...	...	...	...	...	...	...	113	115	117	118	119	120	122
65	...	...	...	...	...	...	...	...	120	122	123	124	125	126
66	...	...	...	...	...	...	...	...	125	126	127	128	129	130
67	...	...	...	...	...	...	...	...	130	131	132	133	134	135
68	...	...	...	...	...	...	...	...	134	135	136	137	138	139
69	...	...	...	...	...	...	...	...	138	139	140	141	142	143
70	...	...	...	...	...	...	...	...	...	142	144	145	146	147
71	...	...	...	...	...	...	...	...	...	147	149	150	151	152
72	...	...	...	...	...	...	...	...	...	152	154	155	156	157
73	...	...	...	...	...	...	...	...	...	157	159	160	161	162
74	...	...	...	...	...	...	...	...	...	162	164	165	166	167
75	...	...	...	...	...	...	...	...	...	...	169	170	171	172
76	...	...	...	...	...	...	...	...	...	...	174	175	176	177

Prepared by Dr. Thomas D. Wood

ABOUT WHAT A BOY SHOULD GAIN EACH MONTH

Age	
5 to 8	6 oz.
8 to 12	8 oz.
12 to 14	12 oz.
14 to 16	16 oz.
16 to 18	8 oz.

ABOUT WHAT A GIRL SHOULD GAIN EACH MONTH

Age	
5 to 8	6 oz.
8 to 11	8 oz.
11 to 14	12 oz.
14 to 16	8 oz.
16 to 18	4 oz.

Try and do as much better than the average as you can

DEPARTMENT OF THE INTERIOR
BUREAU OF EDUCATION

HEIGHT and WEIGHT TABLE for GIRLS

Hgt: Ins:	5 Yrs.	6 Yrs.	7 Yrs.	8 Yrs.	9 Yrs.	10 Yrs.	11 Yrs.	12 Yrs.	13 Yrs.	14 Yrs.	15 Yrs.	16 Yrs.	17 Yrs.	18 Yrs.
39	34	35	36	...	...	...	...	...	...	...	...	...	...	...
40	36	37	38	...	...	...	...	...	...	...	...	...	...	...
41	38	39	40	...	...	...	...	...	...	...	...	...	...	...
42	40	41	42	43	...	...	...	...	...	...	...	...	...	...
43	42	42	43	44	...	...	...	...	...	...	...	...	...	...
44	44	45	45	46	...	...	...	...	...	...	...	...	...	...
45	46	47	47	48	49	...	...	...	...	...	...	...	...	...
46	48	48	49	50	51	...	...	...	...	...	...	...	...	...
47	...	49	50	51	52	53	...	...	...	...	...	...	...	...
48	...	51	52	53	54	55	56	...	...	...	...	...	...	...
49	...	53	54	55	56	57	58	...	...	...	...	...	...	...
50	...	...	56	57	58	59	60	61	...	...	...	...	...	...
51	...	...	59	60	61	62	63	64	...	...	...	...	...	...
52	...	...	62	63	64	65	66	67	...	...	...	...	...	...
53	...	...	...	66	67	68	68	69	70	...	...	...	...	...
54	...	...	...	68	69	70	71	72	73	...	...	...	...	...
55	...	...	...	...	72	73	74	75	76	77	...	...	...	...
56	...	...	...	...	76	77	78	79	80	81	...	...	...	...
57	...	...	...	...	...	81	82	83	84	85	86	...	...	...
58	...	...	...	...	...	85	86	87	88	89	90	91	...	...
59	...	...	...	...	...	89	90	91	93	94	95	96	98	...
60	...	...	...	...	...	...	94	95	97	99	100	102	104	106
61	...	...	...	...	...	...	99	101	102	104	106	108	109	111
62	...	...	...	...	...	...	104	106	107	109	111	113	114	115
63	...	...	...	...	...	...	109	111	112	113	115	117	118	119
64	...	...	...	...	...	...	...	115	117	118	119	120	121	122
65	...	...	...	...	...	...	...	117	119	120	122	123	124	125
66	...	...	...	...	...	...	...	119	121	122	124	126	127	128
67	...	...	...	...	...	...	...	...	124	126	127	128	129	130
68	...	...	...	...	...	...	...	...	126	128	130	132	133	134
69	...	...	...	...	...	...	...	...	129	131	133	135	136	137
70	...	...	...	...	...	...	...	...	...	134	136	138	139	140
71	...	...	...	...	...	...	...	...	...	138	140	142	143	144
72	...	...	...	...	...	...	...	...	...	...	145	147	148	149

Prepared by Dr. Thomas D. Wood

Height and weight to be taken in house clothes without shoes. Weigh on the same day each month. Age the nearest birthday.
Each child to enter his own weight.

that foods are composed of various substances called nutrients, which may be classified as (a) carbohydrates (starches and sugars), (b) fats and oils, (c) proteins, (d) mineral substances, and (e) water. To the nutrients should be added fibrous material and vitamines. Not all foods are composed of these substances in the same proportion. A glance at the figures prepared by the United States Department of Agriculture will make this clear. From the foods given in the chart shown on pages 92 to 97 inclusive select two that are especially rich in carbohydrates; two that are especially rich in fats; two that are especially rich in protein, and two that are especially rich in mineral matter or ash.

38. Overweight and under weight. The question of overweight for men and women of thirty-five years and over is an important one. The Life Extension Institute of New York says, "after the age of 35, overweight is associated with an increasingly high death rate, and at middle life, it becomes a real menace to health, either by reason of its mere presence as a physical handicap or because of the faulty living habits that are often responsible for its development. If there is a family tendency to overweight, one should begin early to form habits that will check this tendency. If considerable overweight is already present, caution is necessary in bringing about a reduction. Barring actual disease, this can usually be done without drugs if the person will be persevering and faithful to a certain régime."

With boys and girls under 20 years of age, over-

AVERAGE COMPOSITION OF COMMON AMERICAN FOOD PRODUCTS

Food materials (as purchased).	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.	Fuel value per pound.
ANIMAL FOOD							
Beef, fresh:	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Chuck ribs	16.3	52.6	15.5	15.0	....	0.8	910
Flank	10.2	54.0	17.0	19.0	....	0.7	1.105
Loin	13.3	52.5	16.1	17.5	....	.9	1,025
Porterhouse steak	12.7	52.4	19.1	17.9	....	.8	1,100
Sirloin steak	12.8	54.0	16.5	16.1	....	.9	975
Neck	27.6	45.9	14.5	11.9	....	.7	1,165
Ribs	20.8	43.8	13.9	21.2	....	.7	1,135
Rib rolls	....	63.9	19.3	16.7	....	.9	1,055
Round	7.2	60.7	19.0	12.8	....	1.0	890
Rump	20.7	45.0	13.8	20.2	....	.7	1,090
Shank, fore	36.9	42.9	12.8	7.3	....	.6	545
Shoulder and clod	16.4	56.8	16.4	9.8	....	.9	715
Fore quarter	18.7	49.1	14.5	17.5	....	.7	995
Hind quarter	15.7	50.4	15.4	18.3	....	.7	1,045
Beef, corned, canned, pickled, and dried:							
Corned beef	8.4	49.2	14.3	23.8	....	4.6	1,245
Tongue, pickled	6.0	58.9	11.9	19.2	....	4.3	1,010
Dried, salted, and smoked	4.7	53.7	26.4	6.9	....	8.9	790
Canned boiled beef	....	51.8	25.5	22.5	....	1.3	1,410
Canned corned beef	....	51.8	26.3	18.7	....	4.0	1,270
Veal:							
Breast	21.3	52.0	15.4	11.0	....	.8	745
Leg	14.2	60.1	15.5	7.9	....	.9	625
Leg cutlets	3.4	68.3	20.1	7.5	....	1.0	695
Fore quarter	24.5	54.2	15.1	6.0	....	.7	535
Hind quarter	20.7	56.2	16.2	6.6	....	.8	580
Mutton:							
Flank	9.9	39.0	13.8	36.9	....	.6	1,770
Leg, hind	18.4	51.2	15.1	14.7	....	.8	890
Loin chops	16.0	42.0	13.5	28.3	....	.7	1,415
Fore quarter	21.2	41.6	12.3	24.5	....	.7	1,235
Hind quarter, without tallow	17.2	45.4	13.8	23.2	....	.7	1,210

Lamb:							
Breast	19.1	45.5	15.4	19.1	....	.8	1,075
Leg, hind	17.4	52.9	15.9	13.6	....	.9	860
Pork, fresh:							
Ham	10.7	48.0	13.5	25.9	....	.8	1,320
Loin chops	19.7	41.8	13.4	24.2	....	.8	1,245
Shoulder	12.4	44.9	12.0	29.8	....	.7	1,450
Tenderloin	....	66.5	18.9	13.0	....	1.0	895
Pork, salted, cured, and pickled:							
Ham, smoked	13.6	34.8	14.2	33.4	....	4.2	1,635
Shoulder, smoked	18.2	36.8	13.0	26.6	....	5.5	1,335
Salt pork	....	7.9	1.9	86.2	....	3.9	3,555
Bacon, smoked	7.7	17.4	9.1	62.2	....	4.1	2,715
Sausage:							
Bologna	3.3	55.2	18.2	19.7	....	3.8	1,155
Pork	....	39.8	13.0	44.2	1.1	2.2	2,075
Frankfort	....	57.2	19.6	18.6	1.1	3.4	1,155
Soups:							
Celery, cream of	....	88.6	2.1	2.8	5.0	1.5	235
Beef	....	92.9	4.4	.4	1.1	1.2	120
Meat stew	....	84.5	4.6	4.3	5.5	1.1	365
Tomato	....	90.0	1.8	1.1	5.6	1.5	185
Poultry:							
Chicken, broilers	41.6	43.7	12.8	1.4	....	.7	305
Fowls	25.9	47.1	13.7	12.3	....	.7	765
Goose	17.6	38.5	13.4	29.8	....	.7	1,475
Turkey	22.7	42.4	16.1	18.4	....	.8	1,060
Fish:							
Cod, dressed	29.9	58.5	11.1	.2	....	.8	220
Halibut, steaks or sections	17.7	61.9	15.3	4.4	....	.9	475
Mackerel, whole	44.7	40.4	10.2	4.2	....	.7	370
Perch, yellow, dressed	35.1	50.7	12.8	.7	....	.9	275
Shad, whole	50.1	35.2	9.4	4.8	....	.7	380
Shad, roe	....	71.2	20.9	3.8	2.6	1.5	600
Fish, preserved:							
Cod, salt	24.9	40.2	16.0	.4	....	18.5	325
Herring, smoked	44.4	19.2	20.5	8.8	....	7.4	755
Fish, canned:							
Salmon	....	63.5	21.8	12.1	....	2.6	915
Sardines	[a] 5.0	53.6	23.7	12.1	....	5.3	950

[a] Refuse, oil.

AVERAGE COMPOSITION OF COMMON AMERICAN FOOD PRODUCTS

Food materials (as purchased).	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.	Fuel value per pound.
ANIMAL FOOD — continued.							
Shellfish:	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Oysters, "solids"	....	88.3	6.0	1.3	3.3	1.1	225
Clams	....	80.8	10.6	1.1	5.2	2.3	340
Crabs	52.4	36.7	7.9	.9	.6	1.5	200
Lobsters	61.7	30.7	5.9	.7	.2	.8	145
Eggs: Hens' eggs	[a] 11.2	65.5	13.1	9.3	....	0.9	635
Dairy products, etc.:							
Butter	....	11.0	1.0	85.0	....	3.0	3,410
Whole milk	....	87.0	3.3	4.0	5.0	.7	310
Skim milk	....	90.5	3.4	.3	5.1	.7	165
Buttermilk	....	91.0	3.0	.5	4.8	.7	160
Condensed milk	....	26.9	8.8	8.3	54.1	1.9	1,430
Cream	....	74.0	2.5	18.5	4.5	.5	865
Cheese, Cheddar	....	27.4	27.7	36.8	4.1	4.0	2,075
Cheese, full cream	....	34.2	25.9	33.7	2.4	3.8	1,885
VEGETABLE FOOD							
Flour, meal, etc.:							
Entire-wheat flour	....	11.4	13.8	1.9	71.9	1.0	1,650
Graham flour	....	11.3	13.3	2.2	71.4	1.8	1,645
Wheat flour, patent roller process —							
High-grade and medium	....	12.0	11.4	1.0	75.1	.5	1,635
Low grade	....	12.0	14.0	1.9	71.2	.9	1,640
Macaroni, vermicelli, etc.	....	10.3	13.4	.9	74.1	1.3	1,645
Wheat breakfast food	....	9.6	12.1	1.8	75.2	1.3	1,680
Buckwheat flour	....	13.6	6.4	1.2	77.9	.9	1,605
Rye flour	....	12.9	6.8	.9	78.7	.7	1,620
Corn meal	....	12.5	9.2	1.9	75.4	1.0	1,635
Oat breakfast food	....	7.7	16.7	7.3	66.2	2.1	1,800
Rice	....	12.3	8.0	.3	79.0	.4	1,620
Tapioca	....	11.4	.4	.1	88.0	.1	1,650
Starch	....	....	....	....	90.0	....	1,675

Bread, pastry, etc.:							
White bread	....	35.3	9.2	1.3	53.1	1.1	1,200
Brown bread	....	43.6	5.4	1.8	47.1	2.1	1,040
Graham bread	....	35.7	8.9	1.8	52.1	1.5	1,195
Whole-wheat bread	....	38.4	9.7	.9	49.7	1.3	1,130
Rye bread	....	35.7	9.0	.6	53.2	1.5	1,170
Cake	....	19.9	6.3	9.0	63.3	1.5	1,630
Cream crackers	....	6.8	9.7	12.1	69.7	1.7	1,925
Oyster crackers	....	4.8	11.3	10.5	70.5	2.9	1,910
Soda crackers	....	5.9	9.8	9.1	73.1	2.1	1,875
Sugars, etc.:							
Molasses	....	....	....	....	70.0	....	1,225
Candy [b]	....	. ..	....	....	96.0	....	1,680
Honey	....	....	....	....	81.0	....	1,420
Sugar, granulated	....	....	....	....	100.0	....	1,750
Maple syrup	....	....	....	....	71.4	....	1,250
Vegetables: [c]							
Beans, dried	....	12.6	22.5	1.8	59.6	3.5	1,520
Beans, Lima, shelled	....	68.5	7.1	.7	22.0	1.7	540
Beans, string	7.0	83.0	2.1	.3	6.9	.7	170
Beets	20.0	70.0	1.3	.1	7.7	.9	160
Cabbage	15.0	77.7	1.4	.2	4.8	.9	115
Celery	20.0	75.6	.9	.1	2.6	.8	65
Corn, green (sweet), edible portion	....	75.4	3.1	1.1	19.7	.7	440
Cucumbers	15.0	81.1	.7	.2	2.6	.4	65
Lettuce	15.0	80.5	1.0	.2	2.5	.8	65
Mushrooms	....	88.1	3.5	.4	6.8	1.2	185
Onions	10.0	78.9	1.4	.3	8.9	.5	190
Parsnips	20.0	66.4	1.3	.4	10.8	1.1	230
Peas (*Pisum sativum*), dried	....	9.5	24.6	1.0	62.0	2.9	1,565
Peas (*Pisum sativum*), shelled	....	74.6	7.0	.5	16.9	1.0	440
Cowpeas, dried	....	13.0	21.4	1.4	60.8	3.4	1,505
Potatoes	20.0	62.6	1.8	.1	14.7	.8	295
Rhubarb	40.0	56.6	.4	.4	2.2	.4	60
Sweet potatoes	20.0	55.2	1.4	.6	21.9	.9	440
Spinach	....	92.3	2.1	.3	3.2	2.1	95
Squash	50.0	44.2	.7	.2	4.5	.4	100
Tomatoes	....	94.3	.9	.4	3.9	.5	100
Turnips	30.0	62.7	.9	.1	5.7	.6	120

[a] Refuse, shell.

[b] Plain confectionery not containing nuts, fruit, or chocolate.

[c] Such vegetables as potatoes, squash, beets, etc., have a certain amount of inedible material, skin, seeds, etc. The amount varies with the method of preparing the vegetables, and can not be accurately estimated. The figures given for refuse of vegetables, fruits, etc., are assumed to represent approximately the amount of refuse in these foods as ordinarily prepared.

Food materials (as purchased).	Refuse.	Water.	Protein.	Fat.	Carbohydrates.	Ash.	Fuel value per pound.
VEGETABLE FOOD — continued.							
Vegetables, canned:	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Per ct.*	*Calories.*
Baked beans	....	68.9	6.9	2.5	19.6	2.1	555
Peas (*Pisum sativum*), green	....	85.3	3.6	.2	9.8	1.1	235
Corn, green	....	76.1	2.8	1.2	19.0	.9	430
Succotash	....	75.9	3.6	1.0	18.6	.9	425
Tomatoes	....	94.0	1.2	.2	4.0	.6	95
Fruits, berries, etc., fresh: [a]							
Apples	25.0	63.3	0.3	0.3	10.8	0.3	190
Bananas	35.0	48.9	.8	.4	14.3	.6	260
Grapes	25.0	58.0	1.0	1.2	14.4	.4	295
Lemons	30.0	62.5	.7	.5	5.9	.4	125
Muskmelons	50.0	44.8	.3	....	4.6	.3	80
Oranges	27.0	63.4	.6	.1	8.5	.4	150
Pears	10.0	76.0	.5	.4	12.7	.4	230
Persimmons, edible portion	....	66.1	.8	.7	31.5	.9	550
Raspberries	....	85.8	1.0	....	12.6	.6	220
Strawberries	5.0	85.9	.9	.6	7.0	.6	150
Watermelons	59.4	37.5	.2	.1	2.7	.1	50
Fruits, dried:							
Apples	....	28.1	1.6	2.2	66.1	2.0	1,185
Apricots	....	29.4	4.7	1.0	62.5	2.4	1,125
Dates	10.0	13.8	1.9	2.5	70.6	1.2	1,275
Figs	....	18.8	4.3	.3	74.2	2.4	1,280
Raisins	10.0	13.1	2.3	3.0	68.5	3.1	1,265
Nuts:							
Almonds	45.0	2.7	11.5	30.2	9.5	1.1	1,515
Brazil nuts	49.6	2.6	8.6	33.7	3.5	2.0	1,485
Butternuts	86.4	.6	3.8	8.3	.5	.4	385
Chestnuts, fresh	16.0	37.8	5.2	4.5	35.4	1.1	915
Chestnuts, dried	24.0	4.5	8.1	5.3	56.4	1.7	1,385
Cocoanuts	[b] 48.8	7.2	2.9	25.9	14.3	.9	1,295
Nuts:							
Cocoanut, prepared	....	3.5	6.3	57.4	31.5	1.3	2,865
Filberts	52.1	1.8	7.5	31.3	6.2	1.1	1,430
Hickory nuts	62.2	1.4	5.8	25.5	4.3	.8	1,145
Pecans, polished	53.2	1.4	5.2	33.3	6.2	.7	1,465

Peanuts	24.5	6.9	19.5	29.1	18.5	1.5	1,775
Piñon (*Pinus edulis*)	40.6	2.0	8.7	36.8	10.2	1.7	1,730
Walnuts, black	74.1	.6	7.2	14.6	3.0	.5	730
Walnuts, English	58.1	1.0	6.9	26.6	6.8	.6	1,250
Miscellaneous:							
Chocolate	....	5.9	12.9	48.7	30.3	2.2	2,625
Cocoa, powdered	....	4.6	21.6	28.9	37.7	7.2	2,160
Cereal coffee, infusion (1 part boiled in 20 parts water)[c]	....	98.2	.2	....	1.4	.2	30

From U. S. Dept. of Agric., Bulletin No. 142.

[a] Fruits contain a certain proportion of inedible materials, as skin, seeds, etc., which are properly classed as refuse. In some fruits, as oranges and prunes, the amount rejected in eating is practically the same as refuse. In others, as apples and pears, more or less of the edible material is ordinarily rejected with the skin and seeds and other inedible portions. The edible material which is thus thrown away, and should properly be classed with the waste, is here classed with the refuse. The figures for refuse here given represent, as nearly as can be ascertained, the quantities ordinarily rejected.

[b] Milk and shell.

[c] The average of five analyses of cereal coffee grain is: Water 6.2, protein 13.3, fat 3.4, carbohydrates 72.6, and ash 4.5 per cent. Only a portion of the nutrients, however, enter into the infusion. The average in the table represents the available nutrients in the beverage. Infusions of genuine coffee and of tea like the above contain practically no nutrients.

(These figures are carried out only to the first decimal place and are consequently only approximate.)

weight does not usually have this significance. If a reduction of weight is desirable, this can be accomplished by exercise and dieting. Carbohydrate foods must be avoided although not excluded altogether, and in their place such fibrous foods as bran cereal, turnips, cabbage, and spinach should be used. Candies and desserts are especially to be avoided.

The greatest danger with children at the present time is that there will be a lack of nourishment with consequent under weight. As a rule, spare children will put on weight if a proper diet is followed. This should include cooked cereals, milk, and eggs. In a later section of the book some suggestions will be given as to the choice of nutritious but inexpensive foods. One of these is milk, the nutritive value of a quart of which is estimated to be equal to that of a pound of beef.

39. Temperance in eating and drinking. In the Boy Scouts' Handbook, Dr. George J. Fisher says, "The average boy ought to have and usually does have an appetite like an ostrich. Three points to remember are: don't eat too much, most healthy boys do; don't eat meat more than once a day; and third, don't eat anything that you always taste for several hours after you have eaten it, even though you like it." In regard to the use of stimulants, Dr. Fisher says: "Should a boy drink coffee or tea? This is a question often asked by boys. Coffee and tea are the greatest stimulants known. But does a strong boy need a stimulant? What is a stimulant and what does it do? A stimulant is a whip, making the body do more at a given time than it ordinarily would. It doesn't add any fiber to

the tissues, doesn't add any strength, isn't a food, but merely gets more out of the tissues or nervous system than they would ordinarily yield. Of course there is a reaction, because the tissues have had nothing to feed on. Herbert Fisher says that Peary's men, who drank lots of tea on their voyage north, during the most trying time of their trip, showed it in their haggard faces

Fig. 45.— Domestic science expert lectures at the Old Dutch Market in Washington

and loss of tissue. Their own tissues had turned cannibal and fed on their own material. *Stimulants are not foods.* They add no strength to the body. They exact of the body what ought not be exacted of it. There is always a reaction and one is always worse off as a result. Growing boys especially should have nothing to do with tea, coffee, or any other stimulant." In this connection it should be unnecessary to say that

tobacco and alcohol should not be used by the growing boy or girl. Alcohol may have a distinct value in medicine when prescribed by an experienced physician but it certainly should not be used as a beverage. Alcohol depresses the intellectual functions of judgment and reasoning power. Tobacco should be excluded during the period of growth as rigidly as alcohol. Both are narcotic poisons; they interfere with growth, with the nourishment of the body and with the work of the brain and heart. If a young man will wait until he is 21 years or over, his judgment will be more mature and he will think twice before becoming addicted to any of these drugs.

40. Regularity of meals. Growing boys and girls frequently pay little or no attention to regularity in eating or to the quantity of food consumed. Candies, cakes, and ice cream are eaten between meals, and children excuse themselves on the ground that "they do not count." As a matter of fact, such foods have a very high fuel value for the body and may displace from the diet a food which the body needs. Pickles, frankfurters, soda water, and candies, which are so frequently used to fill in between meals, should be omitted from the diet and eating confined to three meals taken at regular times.

41. Idiosyncracy. We have all heard it said that "such and such a food does not agree with me." That person is said to have an idiosyncracy for that food, meaning that for some unknown reason the protoplasm of his body will not tolerate some substance contained in the specified food. G. G. Fisher, M.D., Secretary,

Physical Department International Committee Y. M. C. A., an athletic instructor of experience, says: "Some persons cannot digest onions; others thrive on them. Some can't eat cucumbers, others can do so readily. The one must give them up; the other can continue to eat them. Each person has some peculiarity of diet and must observe it to be happy. Many a race has been lost through failure to obey this rule." To some persons mutton is a poison; with others straw-

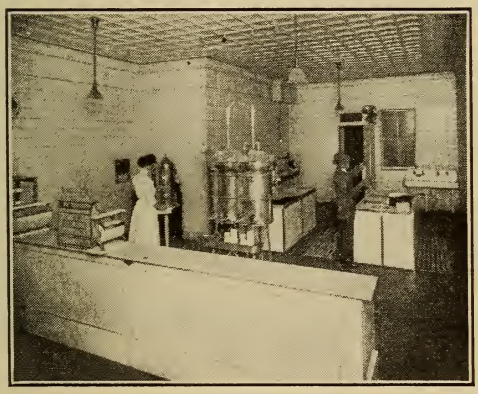

Fig. 46.— Inspecting milk

berries and shellfish, and with others, sugar foods. The author knows one lady to whom butter is a powerful poison, the odor of it producing intense nausea. It is difficult, therefore, to standardize diet. Each one must study his own case and omit from his diet any foods for which he has an idiosyncracy.

42. Vegetarianism. True vegetarianism is rare because most vegetarians use milk, cheese, and eggs, which are true animal foods. It is probably true that

many persons could profit by a closer adherence to a vegetable diet; it is also probably equally true that for others to attempt a vegetable diet would be little short of suicide. Women require less food than men; growing children, more than adults; both require more in winter than in summer; and those who labor out of doors require more than those who labor indoors. A purely vegetable diet becomes monotonous for most persons and, since so much of the vegetable food is fi-

Photograph from Underwood & Underwood

Fig. 47.— A fine growth of sugar cane on a Louisiana plantation

ber, a very large quantity must be consumed. Vegetarians have, however, shown the value of their diet and most persons can eat with profit more vegetables and less meat. It should be noted in speaking of this, that meat has a stimulating effect in the body and those who are going through periods of physical or mental strain will find it well to partake liberally of such meats as beef or mutton.

43. Desirable articles of diet. From time to time attention has been called to foods which should be included in most dietaries. It is well to summarize and classify the information here. Among tissue building foods are to be noted whole wheat bread, milk, eggs, cream cheese, beans, peas, cereals and corn meal; among heat and fat producers are olive oil, oleomargarine, nuts, and fat meat, like bacon; among energy producers are honey (liquid or comb), maple syrup and sugar (pure), and brown, unrefined, cane sugar; among the regulators are greens (such as spinach, dandelions, and beet tops), whole wheat or bran flour, onions, radishes, raisins, dates, figs, oranges, and apples. Canned goods should be avoided, and frequent visits to vegetable stores will serve to stimulate a taste for this very important part of a diet.

44. A study of personal dietaries. Since the broad principles of hygienic eating have been laid down in the preceding paragraphs, it is possible at this point to make an inventory of each personal diet. The following preliminary questions should first be answered:

a. Do you confine your eating to three meals a day? If not, what do you eat between meals?
b. Do you use tea or coffee? If so, how many cups a day?
c. Do you chew food until it liquifies in the mouth?
d. Do fresh or freshly cooked vegetables form a part of at least one meal each day?
e. Do you use graham, whole wheat, or bran bread at least a part of the time?
f. How often do you use fresh, ripe fruit?

g. Do you have a cooked cereal like oatmeal, hominy, or Pettijohn for breakfast at least in the winter months?

h. Do you have at least one glass of fresh milk each day and fresh eggs at least twice a week?

The question now arises as to whether your food is meeting the fuel needs of your body. The amount of fuel which the body can burn is limited, and fuel consumed in excess of this amount is stored as fat or excreted unused. Fuel, less in amount than required, leads to a loss of vitality. How can we measure the amount of fuel the body needs and how can we measure the amount supplied? This has been done many times by scientists in America as well as Europe and consists in having individuals live in a specially constructed room called a *calorimeter chamber*. Chairs, a bed, and a tread machine for the purpose of doing and measuring work are provided. The food consumed is carefully analyzed and weighed as well as the excreta from the body, and the rise in temperature is registered by thermometers. The unit of heat used by experimenters is that amount which will raise the temperature of 1000 grams of water 1° centigrade, and is called a *large* calorie, or simply a calorie. It is not necessary to burn food in the body to ascertain its calorie value, but simply to weigh a given portion, drive off its water by slow heating, and burn it. By the use of the calorimeter and by studying the diets of boys and girls who have exercised a free choice in making up their diets, the New York Association for Improving the Condition of the Poor has prepared the following table

showing the calorie requirement of boys and girls between the ages of 12 and 16:

	Boys	*Girls*
From 12 to 13	2300–2700	1850–2150
From 13 to 14	2500–2900	1950–2250
From 14 to 15	2600–3100	2050–2350
From 15 to 16	2700–3300	2150–2450
From 16 to 17	2700–3400	2250–2550

It has been ascertained that the burning of an egg, or of two slices of white bread, or of ⅔ of a glass of milk, will yield 100 calories of heat. Using the chart given above as well as other charts which may be obtained from the United States Department of Agriculture and elsewhere, compute the total number of calories of heat which the burning of the food consumed by you yesterday furnished your body. Does the result approximate the standard for your age?

45. The economic aspect. It comes as a shock to many persons to know that the highest priced foods are not necessarily the most nutritious, and that of two equally nutritious foods, one may be three times the cost of the other. Thus, sirloin steak costs half again as much as round, and yet a pound of round steak furnishes the body with more protein, fat, and heat than a pound of sirloin does. In like manner, cheese costs less than most meats but furnishes at least as much nutrition; oleomargarine is practically the same in chemical composition as butter and costs much less; a tablespoon of honey, or pure maple syrup, or brown sugar costs much less than one portion of dessert, but

furnishes as much fuel value and is much easier for the body to utilize.

A very interesting experiment along this line was conducted recently by the New York City Police Department and the Life Extension Institute. The detailed report of the experiment is given in a pamphlet called "Food," published by the Life Extension Institute, 25 W. 45th St., New York. The pamphlet gives,

Photograph from Underwood & Underwood

Fig. 48.— A public school class in cooking

in addition to the report on the experiment, some very valuable menus and recipes which provide for an inexpensive but nutritious diet. The subjects of the experiment were twelve policemen ranging in ages from 25 to 31. The group was placed on a diet providing little meat and costing about 25 cents a day. During the three weeks of the experiment, the group gained on an average 3 pounds for each man, and their blood pressure, which was a little high, returned to normal.

46. Utilization of scraps. Since vitamines are present in the skins and leaves of certain vegetables and in fruits and cereals, it is a mistake not to use these parts wherever possible. One of our commonest dietetic errors consists in not using the chaff or outer coating of grains. It is full of valuable mineral substances which are needed by the body and without which the body cannot function properly. Phosphorus, for in-

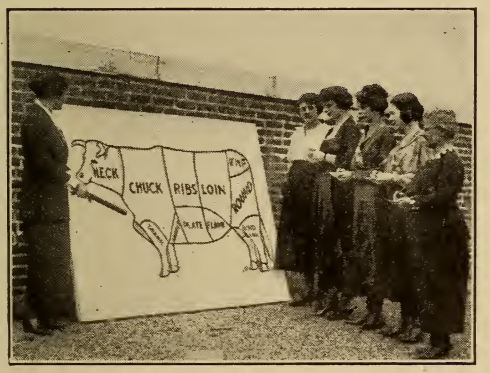

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Fig. 49.— A lesson in economic buying

stance, which is so much needed, is present in the outer coat of grain. Wheat chaff can be bought as bran and can be mixed with white flour to make bread or can be mixed with cereals like oatmeal for a breakfast dish. Another common dietetic error consists in peeling apples and potatoes. Unless a person is distressed by eating the skin of the apple, the fruit should be used as it comes from the tree. The same advice applies to potatoes. The skin of a boiled or baked potato assists in

regulating the function of the bowels and, in addition, supplies valuable mineral substances. Even the water in which potatoes, turnips, carrots, and some other vegetables are boiled should be saved, as a very nutritious soup can be made from it by adding a bone, a few pieces of large macaroni and, if desired, a small piece of beef or mutton. The tops of beets are rich in iron and when boiled make a delicious dish of "greens." Dandelions and milkweed, when picked in the spring, may be used for the same purpose. Pieces of stale bread will improve the condition of the mouth and an excellent pudding can be made from them. Pieces of fat should be "tried out" for shortening. The bones of beef and mutton should never be left at the butcher's but should be used in the preparation of soup, as the marrow and the surface of the bone contain ingredients needed by the body.

CHAPTER VI

THE CARE OF THE MOUTH, NOSE, THROAT, AND THE ORGANS OF SPEECH

47. The Mouth and Nose as germ gardens. Since bacteria are plants, they can be grown, and it is possible to have a germ garden, just as one can have a garden of flowers or vegetables. Bacteria grow well in milk or gelatine, or on raw potato, or in beef broth, or on a gelatinous mass called agar, made from a seaweed found off the coast of Japan. Any one of these substances can be placed in a test tube or in a flat glass dish called a petri dish, and bacteria will, under certain conditions, grow in them.

One of the best places to grow bacteria is in a sterile tube partly filled with sterile agar. If your school is not supplied with agar tubes a few may usually be borrowed from a College or University Department of Bacteriology or from a Department of Health (City or State). When we speak of a sterile object we mean one which contains no form of germ life. *Experiment.* Rub the tip of a needle, made sterile by boiling, over the front teeth two or three times and then make a scratch on the surface of the agar. Stopper the test tube with a plug of cotton made sterile by drawing it through a flame. Put the test tube in

a dark place where the temperature will be about 80° F. In two or three days you will notice a change in the agar. The narrow incision on the surface made by the needle has been replaced by a broad band running down into the incision and also back from the sides. What color is it? This broad band has been made by bacteria multiplying so rapidly and growing so closely together that they form one continu-

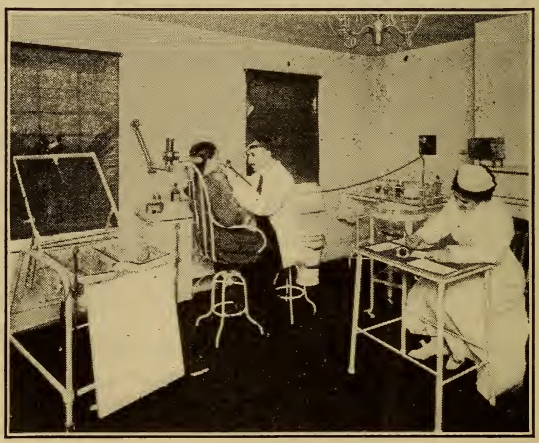


Fig. 50.— The teeth should be examined at least every six months

ous mass. It is said that 400,000,000 bacteria, if packed together, would form a mass no larger than a grain of sugar. It would be difficult to estimate the number that you have raised in your garden in a few hours. They came from the teeth and you can see from this experiment how important it is to brush the teeth and to sterilize the brush after using.

Bacteria are present in the nose and throat as well as

on the teeth. Most of them are harmless germs, i. e., they do not produce disease in the human body. Some, however, are capable of prodcing disease and others decay particles of food that may be left on the teeth. The mouth is an almost ideal germ garden, since the temperature, the moisture, and food are all favorable to their growth. Inasmuch as bacteria producing such diseases as tuberculosis, diphtheria, colds, and grippe may be present in the mouth, nose, and throat, these parts of the body should be kept as clean as possible. This can be done by brushing the teeth frequently, gargling the throat with water, and using a handkerchief to assist in clearing out the nose. Some physicians recommend the use of a nasal douche — the flushing of the nose with a liquid — but others of equal experience advise against the practice because of the danger of injuring the tiny tubes leading from the throat to the middle ear. It is recognized by all physicians that the nose and mouth are the two most important portals for the entrance of disease bacteria into the body.

48. Structure, diseases, and care of the teeth. The teeth are apparently so hard and set so firmly in the jaw that it would not seem possible to injure them. Yet under modern conditions of living they stain easily, decay easily, loosen easily, and finally drop out of their sockets long before their period of usefulness has expired. Why is this? Partly because of a decrease in the amount of fruit eaten, partly because of a decrease in the amount of hard and bulky food, and partly because of a generally decreased vitality due to our mod-

ern housing and working conditions. Is there any way to remedy these conditions so that we may have the hard white teeth that our grandparents had? Fortunately there is, and if the method of correction is followed, especially by young boys and girls, it will result in better teeth and better health generally.

If you rub the tip of the tongue over the teeth you will notice that the teeth are covered with a slimy substance like a thin mucilage. It is this that is responsible for much of the trouble that comes to our teeth. In the first place, food particles stick to it, then decompose with the formation of acids, causing the decay of the teeth; secondly, this slimy substance allows mineral substances to be deposited on the teeth, forming "tartar"; and thirdly, germs, gaining a foothold on the tartar, work their way down between the tooth and the gum, producing disease. Probably every one has noticed that the teeth feel cleaner and harder after fruit has been eaten. This is because the acids in the fruit remove the slimy covering of the teeth. Such fruits as apples, grapefruit, lemons, and oranges should be included in every diet. Another way of removing the slime from the teeth is by eating whole wheat bread or bran bread or crusts of any kind of bread. The chewing of hard and bulky foods requires more muscle work than does the chewing of soft foods like white bread and pastry and, as a consequence, the circulation in the jaw is improved. Furthermore, the particles of solid material in bran and whole wheat bread act like so many little tooth brushes, rubbing up and down over the teeth, removing the slime and min-

eral deposits, and leaving the teeth hard and clean. The teeth, as well as the bones, are made up largely of compounds of calcium; consequently foods containing large amounts of this substance should be eaten. Such foods are whole wheat bread, milk, and eggs.

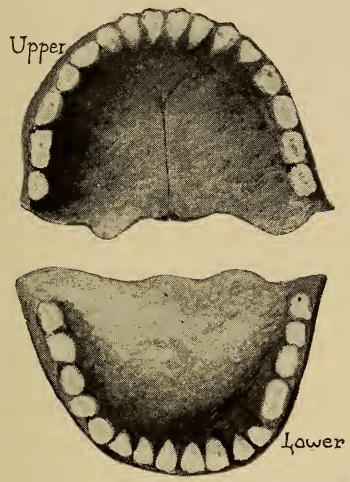


Fig. 51.— Dental chart

Dental examination. It will be well at this point to conduct a dental examination. First make a copy of Fig. 51 on a card 6″ x 8″, putting your name at the top. Now exchange Dental Charts with a pupil sitting next to you. Ask him to press his upper lip upward with the tips of his little fingers so that you can see the upper front teeth. Are they of a pearly white color or are they deeply stained with a dark brown, black, or greenish deposit? If they are stained, write S in the

upper right hand corner of the Dental Chart. Now ask the pupil to pull down the lower lip with the tips of the fingers and examine for stain. If there is much stain present and the gums are drawn down from the base of the tooth and whitish or yellowish matter collects when the gum is pressed against the tooth write a second S on the chart. Be careful not to put your finger, pencil, or other object into the mouth of the other person at any time during the examination, as bacteria may be transferred in this way. Now ask the pupil to open his mouth and to pull back the corners with the little fingers so that you can see the back teeth. Can you see any cavities in the teeth? Are any teeth missing? If so, have they been extracted or have they decayed down to the roots? If you find cavities or decayed teeth place a check next to the proper tooth on the Dental Chart. If you think that further explanation concerning the condition of the mouth should be given, put it at the bottom of the chart. When this part of the examination is finished, exchange cards and allow the other pupil to examine your mouth. When the examination is complete, hand the Dental Charts to your teacher so that he may advise you what to do.

A decayed tooth is not only an inconvenience, making it difficult to chew food and producing a foul breath, but it may be the means of disease germs getting into the blood stream of the gum and being later transported to other parts of the body. So true is this that many physicians of experience are of the opinion that these germs are deposited in the joints, producing rheuma-

tism, and on the valves of the heart, producing a "leaky" heart. Nature's method of cleaning the teeth by means of coarse foods and fruit juices has been indicated. We can, moreover, aid Nature by using a tooth brush. The teeth should be brushed thoroughly at morning and at night. Most persons brush the teeth too fast. It should be done slowly, with a brush dripping with water, and the brush should be pressed into the crevices between the teeth. While there are many tooth powders, liquids, and pastes available, it is well to use occasionally one of the fruit acids such as pure vinegar or lemon juice, in the proportion of one part of fruit juice to two parts of water. After the fruit juices have been used, the teeth should be rinsed well with water. This can be done best by holding some water in the mouth and forcing it between the teeth by compressing and relaxing the cheeks.

Dentists should be called on to do more than to *correct* defects of the teeth. Every person should go to a dentist at least every six months for a dental *examination*. By following this advice slight defects can be remedied at an early period. Finally, students should be advised concerning the assistance that dentists can give by remedying defects of the jaw like projecting teeth, crowded teeth, and misshapen jaws. The art of Dentistry has proceeded so far that most of these conditions can be remedied and many persons saved much inconvenience and embarrassment.

Summary. 1. Your teeth form the cutting and grinding machine which prepares food for the stomach. When this machine is crippled by tooth decay, you

suffer from toothache, indigestion, and many bodily disturbances which are the result of disease germs being carried from the teeth to other parts of the body.

2. The decay of teeth is due to acids formed by the decomposition of food between or on the surface of the teeth.

3. To prevent decay of the teeth, chew the food thoroughly; pass floss silk or silk thread between the teeth

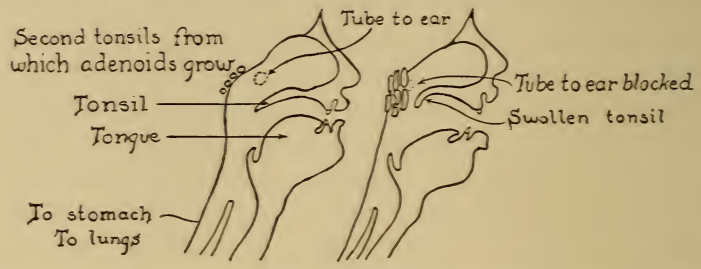


Fig. 52.— Showing how enlarged adenoids and tonsils interfere with hearing and breathing

after meals; carefully and thoroughly brush the teeth with a good tooth brush, on arising in the morning, after each meal, and on retiring at night.

49. The care of the nose. The nose is frequently the seat of obstructions and abrasions. Obstructions occur when the mucous cakes or when bones grow into the nasal cavity, or when tiny hair-like structures called polyps grow from the mucous epithelium into the nasal cavity, or when glandular growths called adenoids form in the back of the nose. Any obstruction of the nasal passage should be remedied, as it may produce mouth breathing. The nose affords normal passage for the air to the lungs. It is provided with an air filter in the

form of hairs; its sides are smeared with sticky mucous to which solid particles may adhere, and it is lined with countless blood vessels which warm the air and thus prepare it for the lungs. It is essential that a handkerchief should always be at hand so that the nostrils may be cleared frequently. In attempting to clear the nose too much force should not be exerted as it is easily possible to rupture the ear drums. This is particularly true when one nostril is held closed. Failure to answer this call of Nature may cause the mucous to cake and drop into the throat and finally into the stomach. If the mucous cakes in spite of all precautions, the nose may be flushed with warm salt water (one teaspoonful of salt to a bowl of luke warm water). This can best be done by pouring the water into the palm of the hand and sniffing it into the nose and down to the throat. This should not be done continually, for if the condition does not improve, a physician should be consulted. Bony projections into the nose may block the passageway for air, produce a nasal tone in the voice, and interfere with sleep. This condition can be remedied by a slight operation.

Warning should be given at this point against the practice of picking the nose. Any tear in the membrane of the nose gives a point of entrance for disease bacteria and blood poisoning may result. A case in point is that of a prominent young physician of New York who was called out of the city recently as a consultant. During the journey, being irritated by a hair projecting from his nostril, he pulled it out. The next day the nose was inflamed and sore. Poisoning had

set in which was carried to other parts of the body and death occurred a short time after.

50. Adenoids and tonsils. The adenoids and tonsils are normal glands found in the throat and back part of the nasal passage. They probably have the same function, that of manufacturing white cells for the blood, and the adenoids are sometimes referred to as the second tonsils. Reference to Fig. 52 will show the position of these glands — the adenoids being higher up in the throat than the tonsils. Frequently these glands become diseased and enlarged, blocking the passageway from the nose to the throat, and from the mouth to the throat, causing difficult breathing, tenderness in the throat, susceptibility to colds and certain important general symptoms. These general symptoms are quite pronounced — drawn face, thick, parted lips, and partial deafness. Added to these symptoms are irritability, paleness, stupidity, and malnutrition. It is surprising to know that the inflammation of such small structures can produce such general body effects but that this is the case has been ascertained after a great deal of medical inspection in the schools. Fortunately, a comparatively slight operation will remove the cause and enable the body to get back to its normal condition.

51. Our organs of speech. In the larynx, just above the upper end of the trachea or windpipe, are two fibrous bands called the vocal cords. Currents of air passing over these cause them to vibrate, somewhat as the bow passing over the strings of a violin produces a vibration, and thereby a sound. Speech is

produced by vocal cords, lips, teeth, tongue, and palate working together. Americans have been very careless in their habits of speech, making little or no study of speech sounds. The science of Phonetics is being studied in the more progressive schools now and is doing much to remedy the condition.

Defects of speech are frequently caused by laziness, lack of vitality, fatigue, defective palate or teeth, and by nervousness. Most of the common defects can be corrected by a study of the laws of speech. Stammering and stuttering cause not only embarrassment but diminish one's earning capacity, as many opportunities to earn a livelihood are closed to those with speech defects. Emphasis should again be given to the opportunity for correction. Most of the large cities now provide specialists in this work and access to them may usually be had even by those who live some distance away. There is little excuse, therefore, for persisting in a speech defect.

CHAPTER VII

DIGESTION, ABSORPTION, CIRCULATION, AND THE HYGIENE OF THE ALIMENTARY CANAL

52. The preparation for digestion. A given amount of food carefully chewed will go farther toward the nutrition of the body than a larger amount hastily swallowed. This is particularly true of vegetable food, as the cells are enclosed by walls of wood. Herbivorous animals, like the rabbit and cow, chew their food very thoroughly. Even meat should be thoroughly shredded in order that the digestive fluids may reach it. Digestion is carried on by liquids in the mouth, stomach, and intestine. These slowly liquify the solid food, so that it can be absorbed by the blood. The teeth are most useful in shredding the food but teeth are confined to the mouth. Some persons eat as though the stomach were provided with teeth. They bite off large mouthfuls of food, swallow it hastily, and trust that it will be liquified later! The continual presence of large, coarse masses in the stomach may produce pain, gas and inflammation. Completely chewed food means easy, thorough digestion, easy and thorough absorption, and, therefore, proper cell nutrition. Moreover, thorough mastication makes it unnecessary to use large

quantities of liquid with the meal. A good rule is to chew the food until it has largely liquified in the mouth. In doing this, the starch will be partly digested by the saliva and the rest of the food will be prepared for digestion in the stomach and intestine.

53. What happens to the food after it is swallowed. The food passes out of the mouth into the oesophagus, which is a muscular tube about a foot long leading into the stomach. During the act of swallowing, the bands of muscle in the oesophagus contract, starting at the top, and force the food into the stomach, where digestion continues to a limited extent. Most persons think that all digestion occurs in the stomach. Such, however, is not the case, for digestion of food goes on even when the stomach is removed, as is sometimes done in cases of cancer. The principal function of the stomach is to churn the food and to reduce it to its proper consistency. This organ is an irregular, pear-shaped pouch, with a capacity of about three pints. The walls are in part made of muscle, some of which run transversely, some longitudinally, and some diagonally. After a meal these contract, churning the food, reducing its consistency, and forcing it finally into a long coiled tube known as the small intestine. Just as some starch digestion goes on in the mouth, so some protein digestion goes on in the stomach. In the walls of the stomach are thousands of tiny glands, some secreting an acid (hydrochloric) and some secreting a digestive ferment, or enzyme (pepsin). When food is in the stomach, it is mixed with these substances and some of the protein portion is liquefied. Digestion

here, as well as digestion in the mouth, relieves glands farther along in the digestive canal. Although the capacity of the stomach is normally three pints, it can be overloaded and stretched. This is the case with those who consume large quantities of drink or food. A distended and misshapen stomach is frequently the source of a great deal of illness. It can be avoided by slow eating and drinking and by temperance in both.

54. The small intestine. Diagrams like Fig. 2 cannot show the true length of the small intestine, for

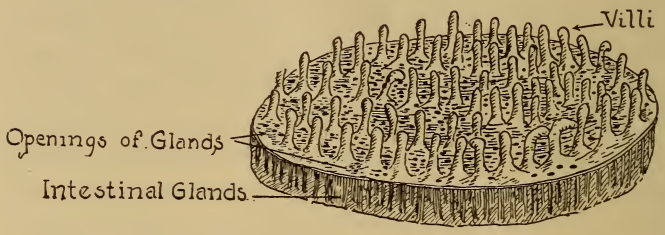


Fig. 53.— Mucous membrane of small intestine

to depict it accurately would occupy too much space. It is about twenty-two feet long and lies coiled in the abdomen. In this tube digestion is completed. Into it are poured bile from the liver, pancreatic juice from the pancreas, and other digestive fluids from glands in its wall.

Bile, secreted by the liver, collects in the gall bladder or bile sac, and is, on occasion, poured into the intestine. It is partly a waste product, being made up of worn out blood corpuscles and other wastes, and partly a digestive fluid, facilitating the passage of fats into

the blood. Conditions described as sluggishness of the liver and biliousness are common. They are characterized by a feeling of irritability, grouchiness, indisposition, constipation, and lack of the usual relish for food. They can usually be corrected by exercise and diet. Any general exercise like walking and swimming is valuable but should be supplemented by special corrective exercises that call for action on the part of the abdominal muscles. Special exercise of this sort is obtained by standing erect, hands on hips, and bending first to one side, then to the other; this should be followed by bending forward and backward and by twisting the abdomen on the hips while keeping the legs rigid. This exercise should be varied by lying on the back and raising the body and the legs alternately from the floor. A corrective diet for the symptoms indicated above should include fruit, marmalade, and fibrous vegetables like turnip, spinach, dandelions, and cabbage (fresh or as sauerkraut). This diet should be supplemented by drinking large quantities of water. In some acute cases a cathartic is needed and, if so, it had better be epsom salts, cascara, or castor oil, rather than a patented preparation whose composition is obscure.

The pancreatic juice, secreted by the pancreas, contains enzymes which digest proteins, oils, and starch. In cases of an unbalanced diet, or of overeating, or of hasty eating, some food will pass on undigested even after the combined action of saliva, gastric juice, bile, and pancreatic juice. Of course, there is always the fibrous content of the food that cannot be digested by any of these fluids. Besides this, there is the residuum

of foods which is capable of being digested but which has gone on undigested. This latter is frequently the source of much disease. If it is not quickly expelled, it is apt to be attacked, in the large intestine, by bacteria producing poisonous substances which are ab-

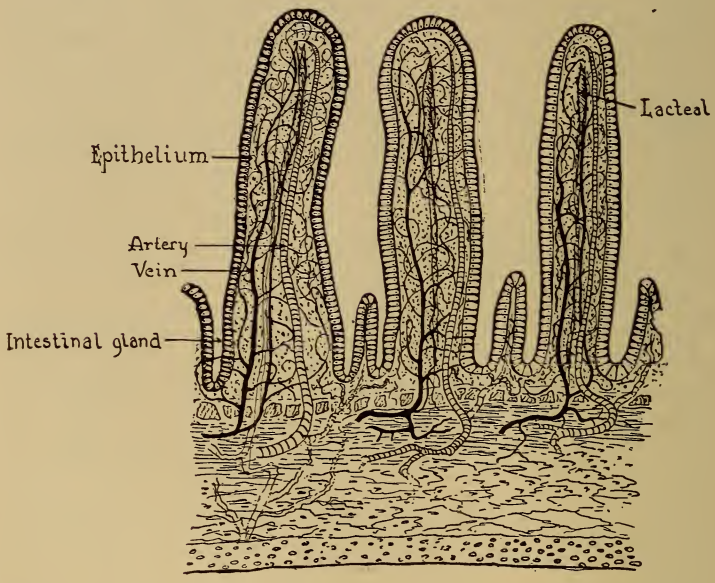


Fig. 54.— Diagram showing how the blood circulates through the villi

sorbed by the blood and distributed over the body. Many headaches and so-called "bilious attacks" are due to this cause. This condition of self-poisoning is common and is responsible for many serious diseases; it emphasizes again the need for careful attention to diet, with the inclusion of liberal quantities of fruit and

vegetables, the need for exercise, and for plenty of water. Water helps to prevent constipation.

55. How is food absorbed from the small intestine? On the interior surface of the small intestine are so many tiny projections that it looks somewhat like velvet. Each of these is a food absorbing structure, known as a villus. Fig. 54 shows that each villus is covered with a sheet of cuboidal cells. These have the power of absorbing needed food materials, which, in case they are mineral matters or digested proteins or starches, are passed on to the blood vessels; or, in case they are digested fats, they are passed on to the lacteals. Food materials going into the lacteals are later emptied into the blood stream.

56. What is blood? Most persons know that blood is a red, thickish liquid, but few persons know that it is continually being made and discarded by the body. Much of it is water and much is digested food. Some of it is solid, some liquid, and some gaseous. The gaseous part is oxygen, breathed in from the air, and carbon dioxide, formed by burning food substances in the tissues; the solid part is made up of red cells, carrying their loads of oxygen or carbon dioxide, and white cells, seeking disease bacteria to devour; the liquid part is largely dissolved food substances. The red cells, which are so necessary to the life of the tissues, are made in the marrow of the bone, and the white cells are probably made in the spleen, bone marrow, and in such glands as the tonsil and adenoid. Red blood can be acquired by eating nutritious foods — cereals, vegetables, fruit, milk, eggs and whole wheat bread; by ex-

ercising out of doors; and by securing mental poise by means of recreation and sleep. All of these are essential and the omission of any one interferes with the process of blood making.

Advertisements for so-called "blood making" medicines emphasize the fact that iron is an essential part of the blood. So it is, but unless prescribed by a physician, patent medicines advertised to contain iron should not be used, but rather such iron-rich foods as spinach, string beans, dandelions, carrots, raisins, and cabbages. All of these contain iron in abundance and in a form easily assimilated by the tissues.

57. Other parts of the body influencing nutrition and growth. The condition of the nervous system has a very important effect on the nutrition of the body. Consequently, it is well to surround a meal with considerable ceremony. Moreover, there are several glands in the body, called ductless glands, because they have no ducts to carry off their secretions. These empty directly into the blood and are represented by the pituitary body at the base of the brain, regulating growth, and the thyroid gland situated at the front and sides of the neck, which has something to do with the nutrition of the body. The thyroid sometimes becomes enlarged, resulting in a condition called "goitre." At one time, these and other glands were thought to be useless structures inherited from our animal ancestors, but now it is known that they are necessary to the life of the organism. This should indicate to us that each part of the body is set aside for a certain function and that neglect

or abuse of any part may have a very serious effect on the rest of the body.

58. The action of drugs on the heart and blood. The heart is a large muscle which contracts, on an average, about seventy-two times a minute, forcing the blood throughout the body so that the tissues may be nourished and the waste products removed. One can get an idea of the work that the heart does in twenty-four hours, if he closes and opens his fist at one second intervals until the muscles of the hand are too tired to work more. The hand begins to tire in a few minutes, but the muscle of the heart keeps up its work, not only for minutes, or hours, or days, but for years. To do its work, it needs a well-toned nervous system, nutritious food, bodily exercise, and fresh, out-of-door air. The muscle of the heart needs care, but it frequently receives, instead, a bombardment of drugs, stimulating it to greater exertion or depressing its energies so that it is unable fully to do its work. Sometimes it is caffeine, at other times nicotine, and at other times alcohol. And yet some persons wonder why they suffer from palpitation of the heart, or from irregular beating, or from high blood pressure.

Alcohol does not give greater strength to the body or mind but it simply stimulates the imagination so that a person thinks that he is gaining strength. Experiments with typesetters, typists, and with students have demonstrated beyond doubt that alcohol produces an increase in the number of errors and increases the time of production. Contrary to common opinion, al-

cohol is, in the long run, not a stimulant but a narcotic. After absorption into the blood, it readily unites with

Photograph from Underwood & Underwood

Fig. 55.— Benjamin Franklin — an advocate of simple living

oxygen, thereby depriving the tissues of this vitally needed element. Unless prescribed by a physician of experience, it should never be used.

Trainers of athletes know that tobacco lessens physical efficiency. Cigarette smoking, in particular, is apt to produce anemia and to interfere with the nutrition of the body.

Records such as those kept by Prof. Charles F. Emerson, Dean of Dartmouth College and a member of the class of 1868, indicate why many educators and physicians oppose the use of alcohol and tobacco. Dean Emerson was secretary of his class and, at the close of senior year, each member was asked to state whether he had used tobacco or liquor while in college. The replies were recorded at the time in a book kept by the secretary. About half of those who reported "yes" as to the use of liquor, qualified the statement by saying, "only light wine, ale, or beer," but they were classed with the users. In the following statistics, no account is taken of any qualification made by members of the class, nor of the personal habits of members since graduation. The secretary has kept an accurate record of the dates of death during the fifty years since graduation, and the statistics are compiled from these data. The average age at death for those who passed away during the past 50 years is 44 years and 11 months for those who used liquor while in college, and is 63 years and 6 months for those who did not use liquor; a difference of 18 years and seven months in favor of non-users. During the first 25 years after graduation, 29.4% of the users of liquor had died, while only 6.7% of the non-users had passed away. The average age at death for those who used tobacco in college is 49 years and nine months, while for those who did not use

tobacco, it is 59 years and 4 months, or nearly 10 years in favor of the non-user. Similar records as those cited above obtained from six other class secretaries indicated similar results, although varying from 3 to 15 years. The total records included observations on 500 young men.

The caffeine of tea and coffee, like alcohol and nicotine, acts on the heart and, if used continually, may produce severe derangement. All may lead to nervousness, digestive disturbances, and anemia.

59. Patent medicines. When a house is out of order, a carpenter is called, and when the body is out of order, a physician should be called. The body deserves the most skillful treatment that it can receive. Many communities now provide physicians to give needed medical treatment free of all charge to those who cannot afford to pay. These officials are men or women who have received a complete medical training and who have been licensed to practise medicine only after a thorough examination. The larger cities support highly organized clinics and hospitals, where expert medical and surgical treatment is given.

In spite of this knowledge many persons use patent medicines. The New York State Department of Health, in a booklet entitled "Patent Medicines," says:

"What you get

when you take a dose of a patent medicine. It is very much as though you took a teaspoonfull of the contents of a drug store slop pail.

Because all patent medicines contain only such drugs as may be got in any drug store, and any particular patent medicine contains just so much of a few of these drugs in a combination no more suitable to your illness than any haphazard mixtures.

Remember the label on a patent medicine bottle is intended to make as many readers of it as possible think it will do them good — to boost the sales.

No one drug or combination of drugs is good for all diseases.

Without medical advice you cannot tell what is the matter when you are sick.

An example: Suppose you have a troublesome headache and take a guess as to the cause, see how easily you might miss the mark, as headache is very noticeable in all of the following conditions:

Typhoid fever
Pneumonia
Also most infectious diseases of severe type, such as smallpox, at onset
All forms of meningitis
Malaria
Anemia
Heart disease
Kidney disease
etc., etc."

Patent medicines are used because they contain stimulants, which may produce a feeling of well being for a time; or they contain purgatives, which often bring temporary relief; or they contain "dope" which may

dull pain; or they contain an alkali, like baking soda, which neutralizes the acids formed by fermenting foods, and thus temporarily relieves stomach ache; or they contain a drug such as opium which may stop diarrhoea for a while."

A fuller discussion of this subject can be found in "The Great American Fraud," by Samuel Hopkins Adams, which is issued by the American Medical Association, 535 North Dearborn Street, Chicago. This association, which has been organized by the leading physicians of the United States and Canada, also publishes a pamphlet, "Making the Right Start," which classifies and rates the medical schools of this country and shows their laboratory and clinical facilities. No prospective student of medicine should select a medical school without first consulting it.

60. A study of the pulse. Turn the palm of the left hand upward and press the tips of the index and forefingers of the right hand gently on the thumb side of the wrist in a depression between a group of tendons which go to the fingers and the long bone which makes up the outer border of the forearm. A distinct throb occurs at regular intervals. This is the pulse. Count the number of throbs per minute while you are sitting quietly. Count them after running up and down stairs. What is the effect of exercise upon the pulse rate? The pulse is produced by the rhythmic discharge of blood from the heart into the arteries. It therefore shows the rhythm and rate at which the heart is beating, the pressure of blood within the arteries, and the elasticity of the walls of the arteries.

61. Treatment of cuts and bruises. Even the slightest puncture of the skin should be washed with an antiseptic such as iodine. It is unsafe to rely on hydrogen peroxide as it is a weak antiseptic. Iodine is very reliable for general purposes. If the wound does not heal, but is inflamed and painful, the probability is that bacteria are present in the wound and a physician should be consulted.

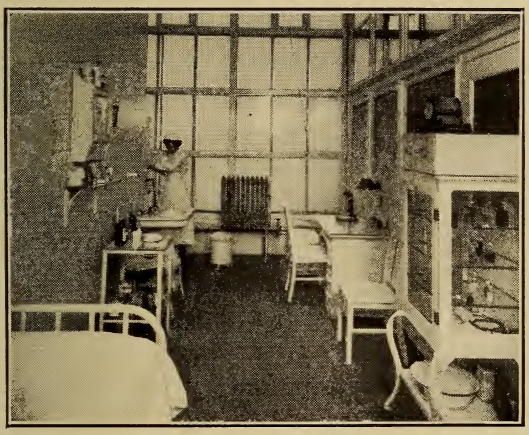


Fig. 56.— First Aid room in an automobile factory

If the wound is deep so that the blood spurts out, pressure must be applied to prevent the person from bleeding to death. The pressure must be applied between the wound and the heart as the spurting blood indicates that an artery has been cut. If the wound is in the arm or leg, a bandage put loosely about the part but tied with a strong knot and later twisted with a stick, will stop the flow of blood. Such a bandage is

called a tourniquet. Practise making a tourniquet out of your handkerchief by tying it about the arm of another person. Remember that the circulation should not be shut off for over a half hour, unless necessary, otherwise, permanent injury may result. Remember, also, that the tourniquet should not be applied any tighter than is necessary.

62. Irritations of the mouth. The lips frequently become chapped during the winter, causing considerable annoyance. In extreme cases, the lips crack and bleed freely. A simple and effective form of treatment consists in rubbing vaseline gently on the lips at night.

Sore spots on the tongue or inside of the cheeks, called cankers, may be treated by rubbing a little powdered alum on them or by dissolving alum in warm water and washing the mouth with the liquid. If the spots do not heal consult a physician.

The application of rouge to the lips is deceptive and harmful. It is deceptive because the redness of the lips should come from circulation of good blood and the person who paints pale lips removes a warning signal of ill health. It is harmful because of its irritating action on the tissues. It should be recalled here that the mouth is one part of the body where cancer is particularly apt to occur and that this disease seems to be frequently associated with such irritations as may be produced by hot liquids or the sharp edges of teeth.

CHAPTER VIII

THE HYGIENE OF THE SKIN AND THE USE OF CLOTHING

63. What is perspiration? The skin is constantly giving off to the air or clothing a watery liquid with a salty taste. Sometimes this collects on the skin in drops but usually it evaporates into the air. One can assure himself that this liquid is being given off to the air by putting the hand into a cold, quart, fruit jar and then packing the mouth of the jar with cotton. A film of moisture soon collects on the sides of the jar. This is perspiration. It has been given off through the tiny pores of the skin, having been carried there by the blood which has collected it from the tissues. It is a part of the liquid waste formed by the burning of foods in the cells. In addition to salts and water, it contains carbon dioxide and urea. It has much the same chemical composition as the liquid which is collected from the blood by the kidneys. One perspires most freely during or after exercise, since more foods are being burned to supply the muscles with energy. Free perspiration lightens the work of the kidneys, since it removes from the body poisonous wastes which would otherwise have to be removed by the kidneys. Failure to perspire freely can usually be corrected by drinking large quantities of water, by exercise, bathing, and diet. Bathing

and a change of clothing are made necessary by the collection of perspiration on the skin.

64. Hygiene of bathing, etc. The perspiration, oil, and dirt which collect on the skin can usually be removed by bathing in warm water containing soap. Any castile or toilet soap will do. Failure to bathe once or twice a week causes the body to have a disagreeable

Photograph by Underwood & Underwood

Fig. 57.— A popular bathing resort — Coney Island, N. Y.

odor. Warm baths, without the use of soap, draw the blood to the skin and thereby rest the nervous system and induce sleep. Warm baths are valuable when one is nervous or tired and produce a restful feeling much more completely than tea, coffee, or other stimu-

lants. Cold baths drive the blood inward, producing exhilaration. They should be taken in the early part of the day and should leave one with a feeling of warmth. Cold baths should be followed by brisk rubbing with a coarse towel. If they do not produce a feeling of warmth they should be avoided and in any case one should leave a cold bath before he begins to feel chilly. Hot towels should not be used in cold weather if one is going out of doors. On leaving a barber shop in cold weather it is well to turn up the coat collar if the hair has been trimmed, as the skin, under these circumstances, is quite sensitive.

If the skin tends to chafe, talcum powder, cornstarch, or oxide of zinc can be applied after bathing. If the flesh is very tender, vaseline will tend to heal it. In the application of perfumes to the body or clothing, discrimination should be shown both in the quality and quantity.

Oily skins can usually be improved by the reduction in the amount of sugary and oily foods and by an increase in the amount of fruits and fibrous vegetables.

65. Eruptions of the skin. It is usual for boys and girls of fourteen or fifteen years to find that the skin becomes rough and even pimply. Attention to diet, the drinking of large quantities of water, use of fruits and vegetables, exercise and warm baths, will help to correct the condition. If the eruption is on the face, an examination should be made to find out whether the condition is caused by "blackheads"— conical masses of oil and dirt which form in the pores and irritate the surrounding tissues. They are frequently pres-

ent and may be removed by a "blackhead remover," which can be purchased at a drug store. After using the instrument, the skin should be bathed in listerine. Under no circumstances should the fingers be used to remove blackheads, because the fingernails easily tear the skin and a new infection may be started. Lemon juice taken as lemonade is said to have a very beneficial effect on the skin.

In the case of boils it is best to apply a hot poultice first. If it breaks, the pus can be removed by gentle pressure from the sides, taking care to cover the fingers with a clean handkerchief or towel. An antiseptic such as iodine should then be applied. If the boil does not break it should be lanced by a physician.

66. Care of the hair. Hair is an outgrowth of the skin and requires cleansing. It may be shampooed as often as once or twice a month, especially if dandruff or excess oil is present. It is well to massage the scalp with the fingertips daily. If the hair is dry and brittle, olive oil will benefit it. Nothing is to be gained by the use of eggs as a shampoo. If dandruff is present it can be relieved by regulating the diet, rest, and by frequent shampoos. For this latter purpose castile soap will do. Wet the hair thoroughly with warm water and then rub the soap into it until a thick lather forms; after this has been worked into the scalp, wash thoroughly with warm water and finally with cold water. Twenty-five per cent. alcohol, rubbed into the scalps once or twice a month, or a ten per cent. ointment of sulphur, used as fre-

quently but not at the same time, may prove helpful.

The hair of school children occasionally becomes infested with vermin. Under such circumstances kerosene should be rubbed into the hair immediately. It is a good practice for each child to arrange to have his hair examined frequently by an older member of the family. If vermin are present in the hair of other children, the teacher should be informed.

67. Care of the nails. The nails should be carefully trimmed with scissors to prevent them from breaking. They should be neatly rounded and should not project a great deal beyond the end of the fingers. Boys will find an inexpensive "nail clip" a convenient instrument. These cost from ten to twenty-five cents and can be bought in drug stores. The nails should not be cleaned with a knife blade as it roughens the under surface, permitting dirt to collect there more easily. Biting the nails is usually due to nervousness. More out of door exercise should be taken and, if the case is pronounced, a physician should be consulted. One who wishes to overcome the habit can get aid by smearing laundry soap, red pepper, wormwood, or bitter aloes over the tips of the fingers.

68. Callouses, bunions, warts, etc. It is always best to consult a specialist in regard to these matters. The science of Chiropody has developed greatly during the past few years and much help may be obtained from it. Blisters on the feet or aching feet are sometimes relieved by holding the feet under cold, running water at night. Frequently, however, the trouble is due to misshapen shoes or fallen arches of the foot.

Much of the inconvenience caused by corns, nails, etc. can be prevented if constant attention is paid to the feet. If they are subject to irritation they should be washed in warm water daily, although soap need not always be used. The nails should be trimmed at frequent intervals, each time cutting straight across and not snipping off the corners. Corns may be made less annoying if rubbed with fine sandpaper. One of the most common causes of foot trouble is that of wearing shoes too short for the foot. Such shoes bind the feet and act as a constant irritant to the skin. Persons with tender or sore feet will find it helpful to change the shoes frequently and not attempt to break in a new shoe at once. House slippers rest not only the feet but the whole body.

69. The hygiene of the clothing. The hygienic value of clothing lies, first, in its power of conducting heat, and secondly, in the power of absorbing moisture. Wool (made from the hair of sheep), cotton and linen (made from the fibers of plants), together with silk (made from the cocoons spun by the silk worm caterpillar), make up a large part of our clothing. Loosely woven material (woolen cloth) is a poor conductor of heat, because its meshes are filled with air, which does not conduct heat well. Tightly woven cloth (cotton) is a good conductor of heat. Clothing therefore does not make heat, but on the other hand it either permits the heat of the body to pass into the air and therefore has a cooling effect, or it prevents the passage of heat and thus keeps the body warm. Several layers of thin

clothing are warmer than a single layer of thick clothing, because the layers of air between the layers of cloth prevent the passage of heat from the body. It is for this reason that layers of newspapers are sometimes put under the clothing.

Woolen clothing takes up perspiration rapidly and does not leave the body damp and chilled as other clothing does.

Clothing should be adjusted to the occupation and to the season. A person doing much muscular work does not need as much clothing as one doing little. Again, one should dress differently in school from what he does on the way to school. In winter, overcoats should be worn to school but they should be removed on entering the building. The same is true of rubbers and overshoes; these are a necessity in stormy weather, but they are a source of ill health when worn indoors. Even shoes should be subject to seasonal changes — low shoes for summer, but not for winter.

The dye in stockings frequently poisons the feet through blisters. If blisters form they should be thoroughly washed and dried and then covered with a thin film of vaseline and a clean, soft white cloth wrapped over the injured part to protect it from the dye.

Rubber clothing, such as a mackintosh, does not allow the heat of the body to pass off readily, consequently such a garment, as well as rubbers, rubber boots, and overshoes should be removed as soon as possible. Mackintoshes and rain coats should be pro-

vided with large pores in the arm pit to allow ventilation.

Socks should be changed frequently, since they absorb the perspiration of the feet. Some persons find

Photograph by Underwood & Underwood

Fig. 58.— Examining immigrants near Ellis Island, N. Y. Clothing often harbors vermin

it necessary to change the socks daily. The odor of the body should be a clean, pleasant one, but this cannot be unless bathing is frequent, the clothing changed often, the teeth kept clean and entire, and the toilet habits are regular.

Tight garments compress the tissues, especially the blood vessels, and therefore interfere with the normal functioning of the body. Tight garters interfere with the supply of blood to the leg, and tight corsets not

only interfere with the blood supply to the organs of the chest and abdomen but compress and distort the intestines, stomach, and liver.

It is, of course, a mistake to wear light clothing in winter and furs in summer. Dressing in this fashion lowers the vitality of the body and consequently the resistance to disease.

Tight hats are frequently a source of headaches. A cap should rest lightly on the head but should not set down so far as to distort the ears.

Woolen clothing is warmer than cotton clothing, and is better adapted for winter wear. Woolen bathing suits are to be preferred to cotton. There is danger of dressing too warmly, as there is of dressing too coolly. If too much bed clothing is used, sleep will be interfered with, and too much clothing during the day may interfere with perspiration. On a cold night two thin bed covers are warmer than one thick one. Why? Dressing too warmly in the house during the winter time may lead to chills when one goes out of doors. Wet clothing is a source of danger as it may lead to colds, rheumatism, or pneumonia. Underwear should be changed frequently as it is constantly absorbing perspiration. It is well to hang up the undergarments at night so that they will be well aired. Of course, undergarments are intended for day wear and a different set of clothing should be worn at night. Night clothes should be adapted to the season, should be washed frequently, and should be aired thoroughly during the day.

As soon as one rises in the morning the bed covers should be pulled down over the foot of the bed and the pillows put on chairs. If sunlight does not strike the bed, the bed clothing should be put near open windows.

CHAPTER IX

THE ORGANS OF SENSE

70. The five senses. Bunyan has described the human head as the City of Man's Soul and has spoken of Satan attacking through the four gates of the city — Eargate, Eyegate, Nosegate, and Mouthgate. Bunyan of course meant by this that evil knowledge comes to our minds through these channels. It is equally true, however, that wisdom comes to us by the same paths. Through the eye comes the wisdom of the ages, preserved in manuscript and print; through the ear music and the solace of other voices; through the mouth and nose food and air, to sustain the mind in all its manifestations. To the senses mentioned by Bunyan, feeling is commonly added, making five in all. As a matter of fact, there are other senses which put us in touch with our environment, but the five mentioned are the ones commonly given.

71. Structure of the human eye. The human eye is a very delicate and complicated organ which frequently becomes defective. Among high school pupils, as many as twenty per cent. have been found to have defective vision. Since the condition of the eye depends a great deal upon its care, and since that in turn depends a great deal on a knowledge of its structure and function, every student should be familiar with the

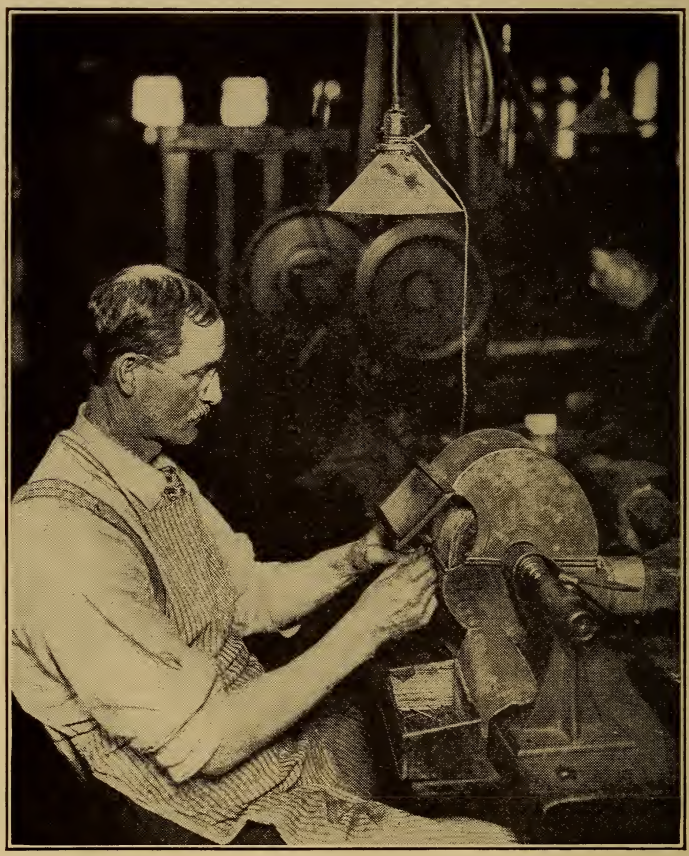


Fig. 59.— A man pointing awls has his eyes fully protected by a glass plate in the hood

general structure of the eye. If you will examine the eye of another person, you notice that it is spherical in shape and has a black circular area in front. This

Fig. 60.— A man chipping iron castings is exposed to eye injury

small black area is surrounded by a colored area (brown, grey, blue, etc.), and this, in turn, by a white area. The black central area is the *pupil,* the sur-

rounding, colored area is the iris, and the white area is a stout cloak which covers the rest of the eye. If you ask the person to shut his eyes for a minute and then to open them, you notice changes in the size of the pupil, especially if he looks first at objects near at hand and then at objects at a distance. You will also see that this change in the size of the pupil is due to the iris, which seems at times to pucker, making the pupil

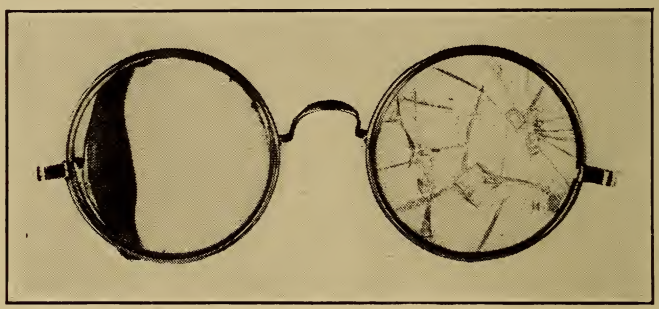


Fig. 61.— Shows spectacles worn by an employee in a steel foundry. A chip of steel from a casting destroyed one lense, as shown above, without injuring the eye of the wearer.

smaller. The pupil is the window of the eye and the iris the curtain. If the iris is drawn back, much light goes into the eye, where it spreads out on the dark interior surface. It is this dark background that makes the pupil look black. The dark background, or retina, corresponds to the plate of a camera, and the rays of light falling on it leave an impression. As each impression is made on the retina, the eye nerve leading from the eye to the brain is stimulated and we see.

72. The care of the eye. The eye is easily irritated and quickly fatigued. It is, morover, subject to bacterial infections. Because of this, care should be taken in the use of towels. Bacteria which have produced a disease in the eyes of one person are often transmitted to the eyes of another person through towels. Since we frequently rub our eyes during the day, it is necessary to keep the hands clean. The author knows of the case of a high school girl who lost the sight of one eye because of a disease transmitted from a subway strap to her hand and thence to the eye. The hands should always be washed before eating and should be washed frequently if one has come in contact with door knobs, car straps, etc., in public places. Soap is one of the best antiseptics known and should be used liberally. For general toilet purposes, castile soap is the best. If a foreign body, like a piece of dirt, gets into the eye, the eye should not be rubbed. The first thing to do is to take hold of the eye lashes of the upper lid and to pull the lid down and out. This will cause tears to run over the eyeball and over the inner surface of the upper lid. Frequently in this way, a foreign body can be washed off. Blowing the nose at the same time may accelerate the tear current.

It is not advisable, under ordinary circumstances, to use any "wash" on the eye. Tears are Nature's eye wash, being composed of salt and water, and having a tonic action on the eye. If the eye is inflamed or if a mucilaginous substance accumulates at the edge of the lids, warm water, to which boric acid has been added, will reinforce the action of the tears. If the

condition is not corrected by this treatment, a physician should be consulted. There are some persons who make a practice of washing out the eyes with water, thinking that the eyes need to be washed. This is ordinarily not true, as the tear glands are constantly secreting a wash which cleans the eye as much as is necessary.

The work of the eye is interfered with by reading while one is lying down, or in a moving vehicle, or through a veil, or in a dim or flickering light. A person should not face the light while reading, but the light should come from behind and preferably over the left shoulder. The book should be held in such a way that it receives the most favorable degree of light. The proper reading distance is fourteen inches for ordinary type and school chairs and desks should be adjusted accordingly. Motion pictures are a strain to the eye and if watched more than occasionally not only fatigue the eye but produce headaches and nausea.

73. **Artificial light.** When one has a choice of artificial light, it is well to use some discrimination. The naked gas flame and the candle flame are so uneven that they flicker and throw fine shadows across the page, easily fatiguing the eye. A gas flame of any kind is objectionable because of the gas which escapes and because of the poisonous products formed during burning. Some plants are so sensitive to these poisons that they die in a few hours if left in a room where gas is burning. For a student's lamp, the acetylene kind does very well. If an electric light is used, care should be taken that it is not too bright and that it

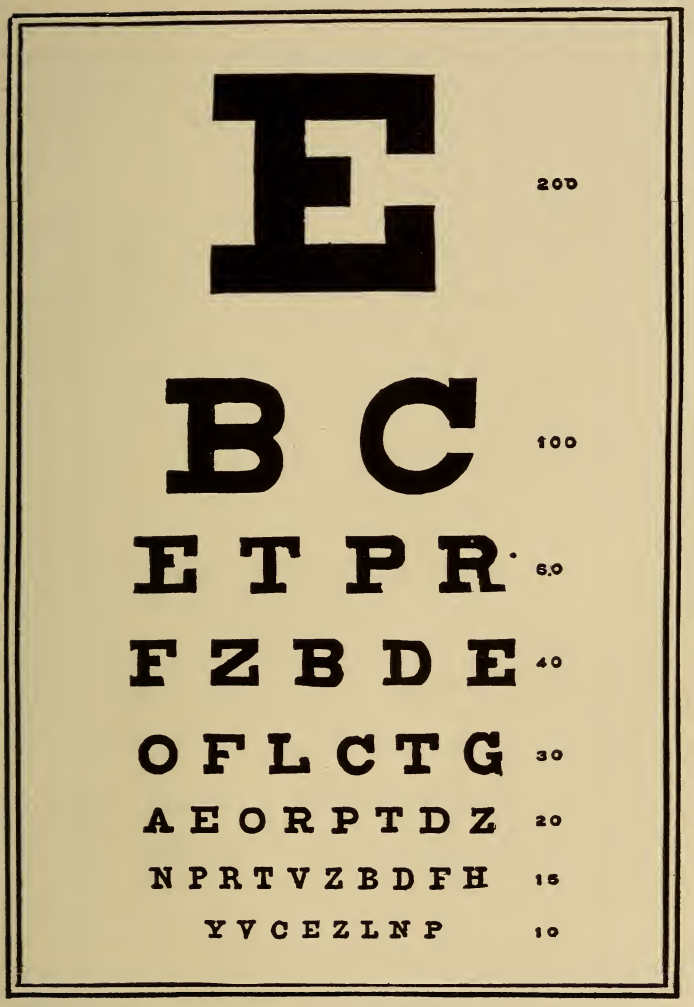


Fig. 62.
Snelling Chart

does not shine directly into the eyes. All light should come from above, preferably from the left, and should be of sufficient intensity to enable one to read comfortably. It is a good plan to close the eyes for a few minutes each day, in order to rest them.

74. Defects of vision. Headaches, sick stomach, aching eyes, blurred vision, a scowling forehead, and squinting eyes are frequently symptoms of defective eye sight. The lens in the front of the eye should be able to adjust itself to near and far objects. When it is not able to do so, objects appear blurred. Again, if the front of the eyeball is not perfectly round, objects appear blurred and a person is said to have "astigmatism." The vision can be easily examined by means of the Snelling Chart, a reduced copy of which is shown on page 151. In a comfortably lighted room, one should be able to read line 30 of the full sized chart from the left to right and from the right to left, at a distance of thirty feet; line 20, at a distance of twenty feet; and line 15, at a distance of fifteen feet. If one is unable to do this, it would be well to consult a specialist on the eye.

75. The structure and care of the ear. What we usually speak of as the ear is only the outer ear, which exists for the purpose of catching sounds. Leading inward from this is a canal, which has a thin sheet of membrane, called the drum, stretched across it at its inner end. Connected with the drum at its inner surface are some delicate bones to which the sound vibrations are transmitted. The waves are finally carried to a sensitive chamber, called the inner ear, whence impulses are sent, through the ear nerves, to the brain.

A thick, brownish substance, called wax, is normally present in the canal and rolls out onto a handkerchief or towel when the external ear is agitated. Sometimes people try to remove the wax from the ear by using a hairpin, match, or corner of a towel. There is much danger in doing this, as it is easy to rupture the ear drum. An old rule says that nothing smaller than the elbow should be put in the ear. If the wax does not roll out of the ear, but collects in a ball, it interferes with the hearing and produces a throbbing or ringing. Many persons who think that they are deaf, might have their hearing restored by the removal of the wax. This, however, should be done by a physician. It is a very simple procedure and involves no pain.

Pain in the ear, or a liquid discharge, usually means trouble. A physician should be consulted if there is a discharge or if the pain persists. Sometimes a simple case of ear ache can be relieved by a few drops of warm olive oil, dropped into the ear while one lies on his side. In doing this, it is best to pull the external ear upward and outward so as to make the canal straight. After the oil has been dropped in, it is well to fill a small bottle with hot water and apply it to the ear. If the bottle is too hot at first, a towel can be wrapped about it.

If an insect gets into the ear, one should not get excited, for a little warm water put in the ear will cause the creature to float out. If children put beans or buttons in the ear, it is always best to have a physician remove them.

Pulling children by the ears, or boxing the ears, is a very dangerous practice, as it may result in tearing the ear drums. Diving is also attended with considerable danger, as the sudden change of pressure may rupture the drum.

While deafness may be caused by wax or foreign bodies in the canal and by rupturing the drum, temporary deafness is frequently associated with colds. The reason for this is that the tubes leading from the middle ear to the throat may become clogged with mucous. The condition usually disappears when the cold gets better.

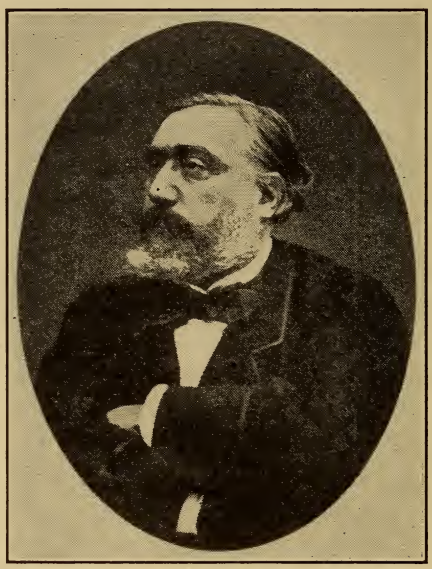
CHAPTER X

MENTAL HYGIENE

76. The human brain is located in the head and is almost completely enclosed by the bones of the skull. Running to it from the eyes, nose, and ears are nerves which tell us what is around us, and running *from* it are nerves which control the heart, lungs, and certain muscles of the throat, jaws, and tongue. The substance of the brain continues down through the vertebral column as the *spinal cord,* which has branches running to the abdomen and appendages.

The brain varies in shape and size. Attempts have been made to show that intelligence depends upon the size or shape or chemical composition of the brain. All such attempts have failed. The average Anglo Saxon brain weights about three pounds. Men of unusual intelligence have had brains which have weighed both more and less than this. Thus the brain of Cuvier, the great scientist, weighed about four pounds, while that of Gambetta, the French statesman, weighed only two and a half pounds. Occasionally one reads that intelligence is dependent upon the amount of phosphorus present in the brain, but there are at least two animals whose brains contain more phosphorus than the human brain — the sheep and the goose. No attention need be paid therefore to the arguments

of phrenologists, who say that they are able to describe one's abilities after an examination of the skull, or to patent medicine fakers, who claim to have discovered a medicine containing elements which will produce new brain tissue. Certain medicinal remedies, to be sure,



Photograph from Western Newspaper Union

Fig. 63.— Leon Gambetta — a distinguished French statesman

stimulate the brain but they supply no new tissue and should be used only under a physician's direction. If brain tissue is needed, the body can build it if supplied with such foods as vegetables, milk, eggs, and cereals,

and the mind, in turn, can be trained by an application of the will power.

77. Why we should study mental hygiene. Nervous breakdowns, paralytic strokes, insanity, and nervousness in general are increasing at an alarming rate. Nerve racking travel, hurried meals, the din produced by whistles, bells, wagons, cars, and trains, the high pitched quest for money, the anxiety incident to keeping a certain social standard, the tremendous responsibilities assumed by business men and women, together with an atmosphere of fault finding, are slowly but surely undermining our nervous fiber. The death rate for middle aged people is much higher in America than in Europe, and insanity is much more common in the city than in the country. It is probably true that many chronic diseases such as indigestion, diabetes, ulcers of the stomach, etc., are fundamentally due to a weakened nervous system. So alarming has the condition become that thousands of city people are looking forward to the time when they will be able to return to the soil from which their parents came.

78. Headache. It was pointed out in a previous chapter that headache may be a symptom of over twenty different ailments. Headache is, therefore, a warning that something is wrong with the machinery of the body and serves the same purpose as a red light on a railroad track. So does all pain. To suppress a headache with aspirin or a headache powder, is to destroy Nature's warnings. It is as rash as would be the engineer who would destroy a red lantern ahead

of his train. If you suffer from headaches, find out whether you need glasses or whether a cathartic is needed or just what is the cause. This can best be done by consulting a physician. If it does not seem advisable to do this, consult your Hygiene teacher or the School Nurse. Remember that you can be of indispensable assistance to the physician by taking a great deal of exercise in the open air, by frequent baths (cold baths have a stimulating action, while hot ones have a soothing effect), by sleeping nine hours at night, by a well selected diet, by avoiding eye strain, and by having needed dental work done.

79. **Nervousness.** This condition may be indicated by restlessness, lack of will power, twitching, tendency to worry or to be easily startled, biting fingernails, etc., or there may be a decided lack of energy and a general indifference. Nervousness is said to be much more common among clerks, students, and teachers than among farmers, laborers, and fishermen. This gives us a suggestion as to its treatment. It responds readily to exercise out of doors, to a well regulated diet, containing plenty of fresh vegetables, dark bread, milk, and eggs.

80. **Epilepsy.** This trouble is characterized by convulsions or fits, and should be treated by a physician. Not all convulsions are caused by epilepsy, however, as they are not infrequently due to auto intoxication, eye strain, decayed teeth, intestinal parasites, and nasal growths. It is always advisable to consult a physician whenever this symptom occurs.

81. **Fears and suppressed emotions.** Fears may

be reasonable or unreasonable; examples of unreasonable fears are fear of the dark, fear of a catastrophe, fear of being unable to sleep, etc. The best way to conquer a fear of this sort is by a close study of the facts involved — do they warrant such a fear; and by attempting to get accustomed to the feared situation. If the fear persists in spite of all that you can do, consult a person who you think will understand your case.

82. Friends of our nerves. Boys and girls who are lacking in energy, or who are pale, or fretty, or "fidgety," who bite their fingernails, or sleep poorly, or lack the ability to apply themselves, can receive help from Nature. *Do not use patent medicines.* You may not know what is in them but even if you do the medicine may do you more harm than good. Follow the general rules of Hygiene and if more is needed consult a physician.

Get nine hours of sleep or rest. It is a good plan to retire not later than ten o'clock and to arise by seven. Sleep with the windows open, out of doors if possible, and use just as little bed clothing as is necessary. On arising, perform the exercises outlined in Chapter III. These may be followed by a neutral bath (water neither hot nor cold). Before eating breakfast drink a glass of water. Eat your meals slowly and eat freely of whole wheat and bran bread, cereals like oatmeal and cornmeal, beef and mutton soups and stews, as well as fruits and vegetables that you like and can afford. Chew the food thoroughly; remember that the wastes of the body will produce

poisoning, if not excreted regularly. Keep in the cool, open air as much as possible, doing what you most enjoy — walking, fishing, playing ball, etc. Nature study is a better remedy for tired nerves than motion pictures. Get interested in something — a story, or stamps, a game, a vocation, or work, such as that of the Big Brothers, Big Sisters, or Scouts. Be very careful of your habits! Avoid tea, coffee, and tobacco. Avoid morbid and distressing stories. Mold your habits and character so that some other person will have faith in you and develop to the utmost your reliance on God.

83. Reflex actions. When a particle of dust gets into the eye, the lids of the eyes immediately close and tears flow over the eyeball; when the hand touches a hot object, the muscles of the arm and hand contract and the hand is quickly withdrawn; and again when a fishbone gets in the throat, the muscles of the thorax contract and coughing is produced in an effort to expell the object. All of these incidents are examples of reflex actions. They happen in the twinkle of an eye. They take place so quickly that we are not immediately conscious of them. Yet notice the purpose that they serve. In the first instance, the closure of the eye prevents more dust gaining entrance and the flow of tears aids the eye in removing the particle already there; in the second instance, the contraction of the arm muscles draws the hand away from the hot object; in the third instance, the coughing is the body's effort to expel the fishbone. Reflex actions are characterized, therefore, (1) by the rapidity with which they

take place, (2) by the absence of volition, and (3) by the fact that they aid in protecting the body. What are the events of a reflex act? These can be best studied in the reflex produced by a hot object, since the action is familiar and involves only parts well known. The first event in this reflex was the feeling

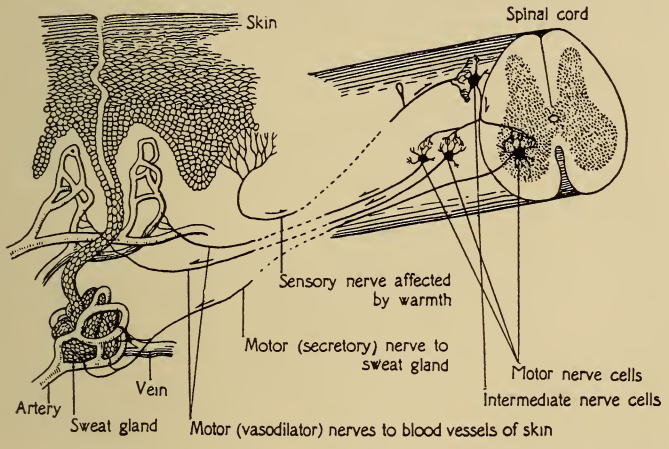


Fig. 64.— Diagram showing a part of the reflex mechanism of the blood-vessels in the skin and in the secretion of perspiration. (From Fitz.)

of heat by the sensitive parts of the skin. Moreover, the heat was so intense that it produced an impulse passing along the nerves leading from the burned area of the skin, to the spinal cord. From the cord, an impulse was sent outward along nerves supplying the muscles which bend the arm. The impulse, on reaching the terminations of the nerves in the arm, caused

the muscle to contract and the arm to be drawn away from the heat. The reflex act involved, therefore, (1) the surface receiving the stimulation (the skin); (2) a nerve along which an impulse passed to the central nervous system; (3) the spinal cord (a part of the central nervous system); (4) a nerve along which an impulse passed from the cord to the (5) muscle. Any reflex act is said, therefore, to involve:

(1) Receptor;
(2) Afferent nerve;
(3) Central nervous system;
(4) Efferent nerve;
(5) Effector.

The nerve impulse which produces the reflex act passes from one part of the nervous system to another by way of nerve cells or neurons. These are very irregular, branched cells, with long, thin processes — one of these being longer than the others and being called an axon. Nerves are bundles of axons belonging to cells of the central nervous system. Although one nerve cell is probably not actually continuous with other nerve cells, yet the end of one is placed very close to the beginning of another. There are, however, gaps between the neurons which have to be passed over by the nerve impulse. It is here that fatigue takes place and it is probably on these parts that such drugs as caffeine and chloroform act.

84. Habits. Such reflex actions as we have just discussed do not have to be learned — they are inborn in the individual. A baby draws his hand away from

the hot stove and attempts to expel an irritating object in his throat almost as quickly as an adult. However, some reflex actions are learned — writing, walking, dressing, etc. Each of these actions was performed in the beginning only with considerable labor, and close attention. As the action was performed over and over again, it not only became easier and required less attention but it was done better and at a great saving to the nervous system, sparing the higher centers (cerebrum) for other thought processes, and delegating to the lower centers (spinal cord and medulla) the task of carrying out a multitude of simple reflexes. How tired your mind would be at the end of a day if you had to think out each motion in dressing, washing, brushing the hair, eating, preparing for school, choosing the route, carrying books, etc., etc. You would have little mental energy left for your studies. For these reasons Professor William James says that the "practical effects of a habit are

(1) Habit simplifies our movements, makes them accurate, and diminishes fatigue.
(2) Habit diminishes the conscious attention with which our acts are performed."

If the acquisition of habits has such a great value to the individual, conserving his nervous energy and giving an opportunity to take up additional educational tasks, it is of the greatest importance to have a few rules in mind to serve as a guide in the acquisition of good habits and in the breaking of bad ones. Professor James gives these as follows:

(1) In the acquisition of a new habit, or the leaving off of an old one, we must take care to launch ourselves with as strong and decided an initiative as possible.

To take for instance the case of a man who is constantly late to work or the pupil constantly late to school, the application of this rule would involve such acts as buying an alarm clock, announcing to friends the new resolve and the making of appointments which necessitate one's presence in office or school before the opening hour.

(2) Never suffer an exception to occur till the new habit is securely rooted in your life. Professor James says that one lapse is like the letting fall of a ball of string which one is carefully winding up; a single slip undoes more than a great many turns will wind again.

(3) Seize the very first possible opportunity to act on every resolution you make, and on every emotional prompting you may experience in the direction of the habits you aspire to gain.

In this connection Professor James says: "No matter how full a reservoir of maxims one may possess, and no matter how good one's sentiments may be, if one has not taken advantage of every concrete opportunity to *act,* one's character may remain entirely unaffected for the better."

Before you leave this subject think of one bad habit which you would like to be rid of, and of an opposite

virtue which you know that you should cultivate. Begin now, strike while the iron is hot, and keep persistently at it each day until you have conquered.

85. The power of concentration. It is said that Charles Darwin, the great English scientist, was permitted by his physician to work, during the latter part of his life, only four hours a day. Yet so great was his ability to concentrate on the work at hand that he was able to accomplish several investigations, any one of which would have been considered a life work by most men. The ability to keep the mind to the immediate task is one of the most fruitful of mental accomplishments. It enables one to do more work of a better quality than would otherwise be the case. Most pupils fritter away their time. They think that they study, whereas from one-half to two-thirds of the time is spent in day dreaming.

As an experimental study of your powers of concentration note the time when you begin the study of one of your lessons and make a check on a slip of paper every time you find your mind is not on the work. Note the time necessary to accomplish this lesson. Keep a record of these figures and note how much your ability to apply yourself increases.

If you find it particularly difficult to concentrate, ask yourself what the possible causes may be. Do you take plenty of exercise? You should be out of doors as much as possible. Does your diet include the foods indicated as essential in Chapter V? Do you get nine hours of sleep each night? Do you drink tea or coffee or use other drugs — if so, stop it. Do you have

a quiet room for study? If not, can't you arrange to use a public library or another suitable place? Are you interested in your studies? If not, talk over the difficulties with the teacher or principal. Finally, have you selected the right companions — those of your own age and those who are seriously interested in school work?

86. Steps to success. Just as some of the deepest sinners have become some of the greatest saints, so also have boys and girls, who at first showed little talent or promise of success, become leading thinkers and workers. In some cases, this can be explained by a lack of appreciation or sympathy on the part of parents or teachers. In other cases, however, it has been due to self discipline — the individual recognizing his shortcomings and striving to correct his weakness. It is well for a pupil to form a close friendship with a teacher and to invite the latter to point out his weak points. Study the biography, or better the autobiography, of someone you greatly admire, to find out what some great man or woman has done to achieve success. Strengthen your memory and your powers of discrimination by keeping a diary and by taking notes on lectures and speeches. Keep a small note book where you can enter the names of books or magazine articles that have proved of value to you. It is usually too much of a task to carry these things in the mind but if they are carefully entered in a note book they will serve as pegs upon which to hang other facts. If a certain opinion regarding the cause of a period of rainy weather is current in your neighborhood, inves-

tigate it to see if the facts support the theory. Many persons believe that flies develop out of rotten fish. Is it true? Others believe that a horse hair kept in water for nine days will develop into an eel. Will it? Before you express an opinion run over in your mind the facts bearing on the case. A person of sound judgment is one of the most valuable members of a community. If you are interested in insects or flowers or machinery or houses, learn to make simple, accurate, labeled drawings of the objects. In the midst of confusion, keep your wits.

87. The discipline of studies. Contact with Nature is the best school for training the senses. The fine lines, delicate coloring, the estimation of distances train the eye, while the perception of slight sounds, such as those made by the movements of small animals or the interpretation of bird and insect notes, train the ear. Books and contact with other minds discipline and enrich the mind. The educated American who is unfamiliar with the history of democratic movements is as lame as the cripple who hobbles down the street with the aid of a cane, and the man who lacks confidence in his ability to "tackle" a problem or the man who continually makes snap judgments is as much handicapped in a struggle to get somewhere as he would be if his legs were tied together.

CHAPTER XI

FIRST AID

88. Fires and panics. Young men and women can be of very great service in time of panics if they keep their wits and station themselves at favorable places to direct and calm others. In case of accidents, try to be of service instead of standing by and idly looking on. In cases of fire, find the nearest alarm and, following directions carefully, put in a call for help. Do you know the location of the Fire Alarm Boxes nearest to your home and to the school? Do you know precisely how to ring in an alarm? If you do not, get the information before you go home to-night.

If you are in a burning building, remember that the air within six inches of the floor is free from smoke. If it is necessary to carry an insensible person from a smoke filled room, tie his hands together with a handkerchief and put them over your head, and you can crawl along the floor, dragging the person with you.

If your clothing should catch fire, roll over on the floor to smother the flames. If a mat or heavy blanket is at hand, roll up in that as tightly as you can. If the clothes of another person catch fire, roll him up in a coat, mat, or blanket.

89. Burns and scalds. The painfulness of a burn

or scald can be relieved by applying a paste made by adding a little water to soda, flour, cornstarch, or by gently rubbing on a little vaseline, cream, or oil. Probably the handiest and simplest application is soap. It can be softened a little by putting it in hot water. Do not try to remove clothing that sticks to a burn. Such a burn is serious and needs the attention of a physician.

Photograph from Underwood & Underwood

Fig. 65.— Los Angeles firemen learning how to rescue those overcome by smoke

90. Ice rescue and drowning. If it becomes necessary for you to attempt the rescue of a person who has broken through the ice, you should first tie a rope around your body and have the other end tied or held on shore. To approach the person, lie on your stomach and push ahead of you a pole or board or ladder, until the person can reach it. If you break through

the ice, and rescuers are near, support yourself on the edge of the ice until help arrives.

In case of apparent drowning, lay the person on his stomach, face a little to one side, so as to allow the water to run out of his lungs. Then getting astride the person press the hands into the region of the short ribs to force water out of the lungs. Relax the pressure now to draw air into the lungs. Repeat this process at intervals of four seconds. It may be necessary to keep it up for an hour or two before signs of life appear.

91. Fractures. In case a leg is broken, make the injured person as comfortable as possible, supporting the leg so that it will lie flat. If it becomes necessary to move the person and a stretcher is not available, perhaps a door can be unhinged and used as a stretcher. If the skin has been broken and antiseptics are available, wash the wound gently and then cover it with a piece of clean cloth. In order to prevent movement of the limb, a board, running from the sole of the foot to the arm pit, should be bound to the leg and to the body. A short splint on the inside of the leg, covering the fracture, will help to further hold the leg in position until a physician can be obtained. In general a patient with a broken bone should be made as comfortable as possible until medical aid can be obtained. Great care should be taken, in the case of fractured arms or legs, not to bend the part, as the bones will be displaced and the skin may be ruptured, which may produce an infection.

92. Bruises, sprains, and dislocation. If a joint

of the arm or leg is sprained, put that part in an elevated position and wrap cloths wrung out in hot or cold water around it. The joint must be given perfect rest and the cloths should be kept tight about the limb and changed frequently. A bruise should be painted with iodine or washed with some other antiseptic and then bathed in hot or cold water. Do not try to get a dislocated joint back in place. Cover the joint with hot or cold applications and take the person to a doctor.

93. **Slight wounds (pin pricks, cuts, or tears).** Suck some of the blood from the wound and then wash it with iodine.

94. **Wounds with severe bleeding.** Bleeding from a cut artery is more dangerous than bleeding from a cut vein, as the blood is coming direct from the heart. If the artery is cut, the blood is bright red in color and spurts out of the wound. In such a case, tie a tourniquet around the limb, between the wound and heart. The tourniquet can be made by tying a handkerchief loosely but making the knot tight, and then slipping a stick under the handkerchief and twisting it so that the handkerchief binds the limb tightly. If the wound is not in a limb, press the finger into the flesh between the wound and heart, to see if you can feel the pulsating artery. When you do, press a small block of wood or a stone on this point, so as to prevent further bleeding. If a vein has been cut, a pad or cloth fixed firmly on the wound will usually prevent further bleeding. If a vein in the neck is cut, blood is lost so rapidly that the person is in danger of immediate death and the finger should be applied immediately.

Tourniquets should not be left on longer than half an hour.

95. Fainting. If the face is pale, lay the patient on his back in a horizontal position. If the face is red, raise the head on a pillow or coat. Loosen the clothing about the neck and chest. Put a cloth wrung out in cold water over the forehead and sprinkle cold water

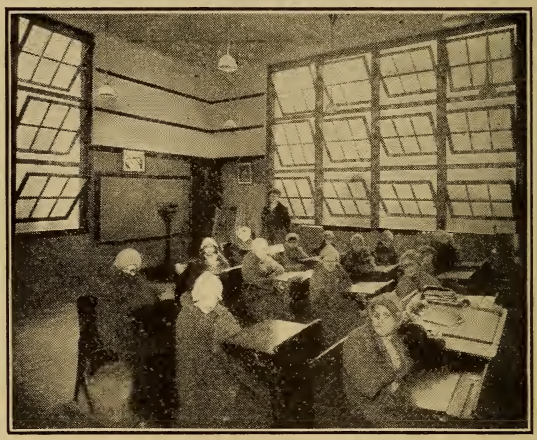


Fig. 66.— A fresh air class

on the face. Rub the limbs toward the body. Do not allow the patient to get up until he has fully recovered.

96. Frostbite. Rub the frozen part gently and gradually with snow or cold water until the flesh becomes warm and begins to sting or burn. The patient should endeavor to exercise the part when this occurs.

97. Poisoning. First send for a physician at once, then do as follows: If a poisonous substance has been taken, prompt effort should be made to produce vomit-

ing. The first thing to do is to give a cup or bowl of lukewarm water to which salt or mustard may be added. This will hasten vomiting but it is well to put the finger back in the throat as soon as the liquid has been taken. Repeat the dose several times, using large quantities of water. If a strong acid has been taken, baking powder, plaster from the walls, or soap should be added to the water. If an alkali has been taken, dilute vinegar or lemon juice should be used. If the tissues have been badly irritated, olive oil or milk to which a beaten egg has been added, should be given.

98. Ivy Poisoning. Poison ivy grows as a trailing vine or as a shrub and can usually be recognized by its clusters of three leaves. The leaves are long and narrow, dark green above and lighter below. It is commonly found along stone walls, fences, rocks, or twisted around the trunks of trees. The juice of the leaves, roots, flowers, and green fruit causes an irritation of the skin which is not fatal but very annoying. Poisoning may be caused by contact with the plant or by handling clothing or utensils which have been in contact with it. It is possible that its pollen, which is carried long distances by the winds, is capable of causing the poisoning.

Some persons are more resistant to the disease than others, but it is not probable that any are entirely immune. The parts of the body most frequently attacked are the hands, face, and forearms. Burning and itching are the first symptoms of the trouble, followed by inflammation of the skin and a fine rash. There is a strong desire to scratch which gives but slight relief

and often tends to aggravate the irritation and is liable to spread the poison to other parts of the body.

If one is known to have been in contact with the plant, prompt and thorough washing with soap and hot water will almost surely prevent the irritation. The washing must be very thorough and may be followed by washing with lime water, alcohol, or household ammonia, diluted with an equal amount of water. If these remedies do not prove successful it is best to consult a competent physician.

99. Nosebleed. Loosen the collar. Do not blow the nose. Apply a piece of ice or a handkerchief wrung out in cold water to the back of the neck. A wad of paper inserted between the upper lip and gum will help. If bleeding continues, plug the nostrils with cotton and consult a physician.

100. Convulsions (fits). Convulsions are often a symptom of a disease called epilepsy, in which the person gnashes the teeth, froths at the mouth, and then falls unconscious. No attempt should be made to prevent the movements, but the patient should be placed on the ground or floor and protected from harm as gently as possibly. If there is danger of biting the tongue, it is well to insert a piece of wood or a wad of paper between the teeth and then hold it in place. No effort should be made to rouse the person but he should be allowed to sleep until he awakens naturally.

101. Sunstroke. By this is meant a sudden attack of illness from over exposure to heat.

If the body is very warm the treatment consists in reducing the temperature of the body as rapidly as

possible by bathing with cold water and by the application of ice.

If the body feels cool, the treatment consists in rubbing the surface of the body and the extremities, and the application of hot water bottles to the feet. The body should be covered with blankets, and kept warm. If the head becomes hot, apply cold water to it.

PART II

SCHOOL AND HOME HYGIENE

CHAPTER XII

SCHOOL HYGIENE

102. Introduction. The school is your home for at least six hours a day and you should do all that you can to make it a healthy and beautiful place to live in. If the building is new and well constructed, preserve it for others. Wipe your feet on mats when you enter; refrain from throwing papers or waste on the floors — use the waste basket; don't leave fingermarks on the walls; don't mark up desks and walls; don't pollute the air by sneezing or spitting; pick up papers from the floor; and finally, keep your desk so clean that you will be proud of it. Present a tidy appearance yourself. Use soap and water on your hands and face before coming to school; have your hair neatly brushed, and your finger nails cleaned. If the building is not what you would like it to be, show the city fathers that you appreciate even what has been given to you and then present to them a dignified, well thought out appeal for improvements. The pupils of the Julia Richman High School of New York were housed in five buildings, one of which was built in 1847. The rooms in this building were poorly ventilated and classes were separated from one another only by curtains. The working conditions were almost unbearable. The pupils took an inventory of their school

home, drew up a brief, and presented an argument to the school and municipal authorities for a new building. Their efforts were rewarded by the allotment of $325,000 for the purchase of a new site upon which a new building will be erected to house the entire school.

103. A study in school hygiene. Put a numbered label on each of ten test tubes containing sterile agar. Do not open No. 1; leave No. 2 open for thirty min-

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Fig. 67.— Small girls make good housekeepers later

utes in the class room during a recitation period; leave No. 3 open for thirty minutes in the hall or corridor, while classes are passing; put two or three drops of water from a school faucet or drinking fountain in No. 4; put a few drops of thoroughly boiled water in No. 5; open No. 6 quickly and have a pupil who has just washed his hands touch the agar in two or three

places with his fingers; have a pupil who has not washed his hands for two or three hours touch the agar in No. 7; open No. 8 in the room for five minutes and then leave it in the sunlight; do the same with No. 9 but put it in a dark place; touch the feet of a fly to the agar in No. 10. Keep the tubes at room temperature for a week.

(a) Compare numbers 1, 2, and 3. Which one has

Fig. 68.— A school dental clinic

the greatest number of bacteria or mold colonies? Which the least? Explain.

(b) Why is it advisable to boil water if one is camping?

(c) Name a good antiseptic for the hands.

(d) Why should a house be supplied with an abundance of sunlight?

(e) Why are flies objectionable?

104. Care of drinking fountains, cups, and toilets. Only a few years ago, it was a common practice for many persons in homes, schools, and shops to use the same drinking cups and towels. These have now been replaced in most cases by water fountains and individual paper towels, and they will be replaced in all cases if the public will agitate actively against them. Such common utensils are a source of very great danger, because they frequently act as distributing agents for eye and skin diseases and certain internal diseases

Fig. 69.— A school garden

like typhoid. Pupils should note here, however, a possible source of danger in drinking fountains. The jet of water should rise at least two inches above the top of the fountain so that it is not necessary for the lips of the drinker to come in contact with the fountain itself. If the lips do come in contact with the fountain, the latter may become a source of infection, as disease germs may be caught in the currents which revolve about the mouth of the fountain. Each pupil should be a Hygiene Inspector and, if he sees another

pupil misusing a fountain, should report the fact to the proper school authority.

105. Lunch rooms. It is an act of self-protection for pupils to insist that food at the lunch counter be covered as much as circumstances will permit. Glass cases should be provided to prevent handling of food and also to keep dust from settling on it. Paper cups should be used for drinking purposes. Milk should be covered and school authorities should be provided with a lactometer to test the composition of the milk. The woodwork should be washed with soap and water and the floors cleaned frequently. Waiters at the counters should be required to wash their hands with soap and water before beginning work and to present a tidy appearance.

106. Inspection of janitorial service. Pupils can be of great service to their school if they will report to the principal, or to some one designated by him, instances where janitorial service is unsatisfactory. There may be cases where sweeping has not been done, or where rooms have not been heated or ventilated, or where dry cleaning has been resorted to. Except where expressly permitted, rooms should not be swept during school hours. Special cases may be allowed in the discretion of the principal. Halls should be cleaned by means of oiled brushes or by first sprinkling the floor with oiled sawdust and then sweeping it up. Toilets should be well ventilated and kept in an efficient, sanitary condition.

107. Hygiene and Sanitary Squads. Pupils who are particularly interested in the upkeep of the school

can be of service by organizing squads for the purpose of supervising the lunch room, the general sanitation of the building, or the personal hygiene of the pupils. Much good can be accomplished in this way as, both by suggestion and example, other pupils will come to understand that cleanliness comes next to godliness.

CHAPTER XIII

HYGIENE OF THE HOME

108. Ideals in home building. Inasmuch as America is relatively a thinly populated country, most persons have some freedom of choice in the selection of a home. There are great areas in the east, west, north, and south that would afford opportunities to many persons for earning a livelihood and for healthy living. Furthermore, adjoining the large cities, are the suburban districts, where each man may have his own land and home. Aside from the matter of convenience, expense, etc., the sanitary aspects of home building, which may be called the ideals in home building, should always be taken into consideration. These are: (1) the home should be built on high, dry land; (2) it should be well lighted but should have a few shade trees near; (3) it should be provided with a sanitary water system — either well or reservoir; (4) it should be connected with a well conducted sewage system; (5) it should have a large, dry cellar; (6) it should be well sheltered from prevailing winter storms; (7) it should have an efficient heating and lighting system.

109. Keeping a home clean. Benjamin Franklin urged cleanliness in all things — body cleanliness, cleanliness of clothing, and cleanliness of habitation. A lack of cleanliness means slovenly habits, both mental and

physical. The successful business and professional men are those who keep their offices well ordered and who themselves present a tidy, neat appearance. Boys and girls should keep this in mind, as they will be judged largely by these points when they come in contact with teachers and employers. It is difficult for the individual to be clean if the home is not clean. Soiled clothes should not be left in corners or closets but

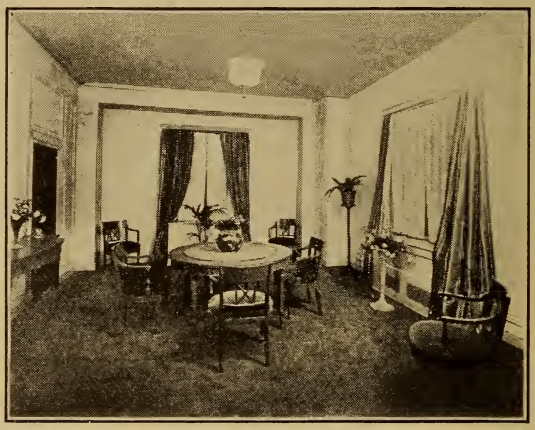

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Fig. 70.— A well lighted and notably kept room

should be put in baskets or bags made for the purpose. Food should not be left on the table and dishes should be washed with soap and hot water after each meal. The floors should be swept and the woodwork washed frequently. Dry dusting should be avoided, as it simply sweeps the dust into the air to be inhaled or to fall to the floor again. Rugs are preferred to carpets

as they can be more easily taken up and cleaned outside of the house. Carpets can best be swept if pieces of damp papers or damp tea leaves are first spread over them. This will prevent the dust from rising into the air. Carpet sweepers and vacuum cleaners are valu-

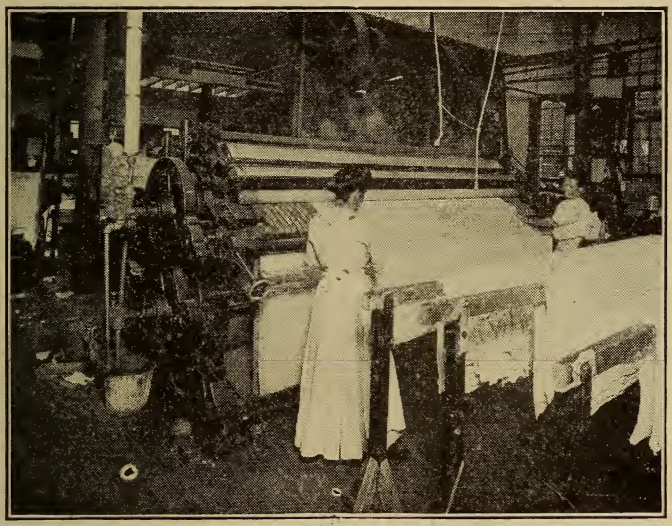

Fig. 71.— Ineffective protection against excessive steam and humidity

able helpers to the housekeeper. The woodwork in sitting rooms, parlors, and bed rooms should be wiped with a cloth that has been slightly oiled. Bed linen should be changed every week, except in cases of sickness where it should be changed every day. If beds become infected with vermin, as they do sometimes even with unusual care, it is necessary to expose the

mattress and bedding to the sunlight and to spray them, together with the framework of the bed and the woodwork of the room, with a preparation made for that purpose. This can be obtained in any drug store.

110. **The laundry.** The washing of clothing is necessary for purposes of appearance and for purposes of

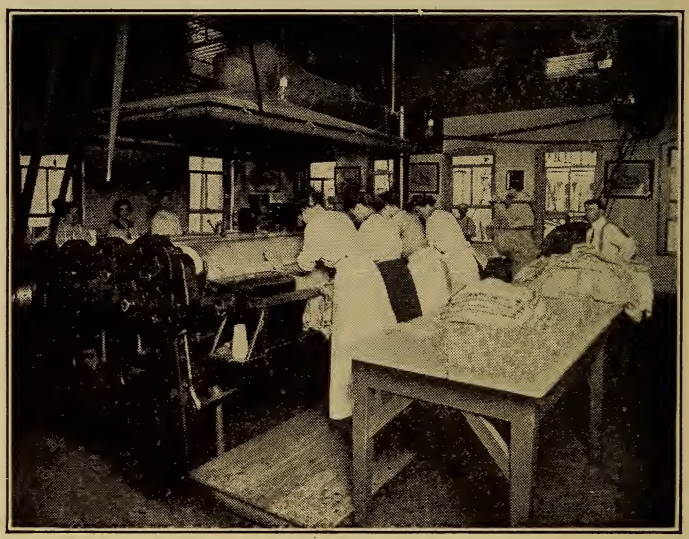

Fig. 72.— Effective protection against excessive steam and humidity

health. The underclothing is in contact with the skin and collects oils, dirt, and particles of skin. If not removed frequently it may become the breeding place for bacteria or vermin. Outer clothing, such as coats and skirts, continually gathers dirt and filth and should be frequently brushed in the open and hung in the sun-

light. Underclothing should be washed in soap and hot water to remove the dirt and to destroy bacteria.

111. **Bathrooms and toilets.** Toilets are frequently the source of discomfort. They should be continuously ventilated and should be shut off from the remainder of the house. Each toilet is provided with a mechanism for releasing a current of water and this mechanism should be used frequently. Every toilet is apt to generate a foul odor, even with the greatest care, but this can usually be counteracted by adding a few drops of lysol or some other disinfectant to the water in the bowl. The floor of the toilet, as well as the wood and metal work in it, should be frequently washed with soap and water.

Each family should have its own bath tub and this should be frequently cleaned with soap, water, and a disinfectant. If it becomes necessary for one to use a bath in a boarding house or hotel, it is well to rinse it out thoroughly before using. Shower baths are preferred to tubs because it is very difficult to keep the interior of the latter clean.

112. **Plumbing.** The pipes running from sinks, toilets, and baths, if not cleaned, will attract roaches and water bugs, which may in turn distribute disease. It is a good plan to rinse such pipes with washing powder and to be particularly careful to see that no crumbs of food are left around. In spite of the greatest care, vermin sometimes creep in, in which case it is necessary to sprinkle roach powder freely about the infested parts. Open plumbing is preferred to that enclosed in woodwork, as it is more accessible to light and air and can

be more easily cleaned. Sinks and plumbing can most easily be kept clean if the drain pipes are covered by a moderately fine filter which will prevent other than the smallest particles of waste from passing through. The waste which collects in the sink should be removed and put in a covered pail, which should preferably be kept outside of the house but, at any rate, away from the

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Fig. 73.— Following the letter but not the spirit of a law which did not allow milk to be kept in stables after milking, but failed to mention the hoghouse

kitchen. If the drain pipe does become clogged it can usually be cleaned out by fastening the nozzle of a short hose to the faucet and passing the other end deep down in the pipe.

113. **Garbage.** Waste from the table should be put in a covered metal can after each meal, and the contents of the can should be removed from the premises frequently. A metal can is better than a wooden one, as oils and other liquids are apt to seep through the latter, making it filthy. If it is necessary to keep the gar-

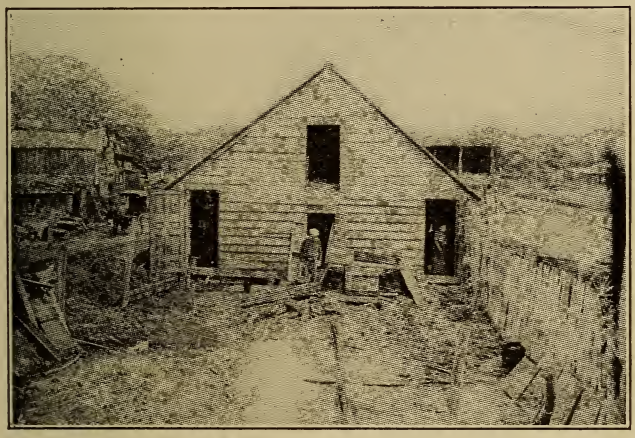

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Fig. 74.— Stable yards of this type are all too common. The cows are compelled to wade knee deep in manure in order to get into this stable. Much of the filth on legs and tail from this source gets into the milk

bage can on the premises, it is well to sprinkle washing powder about it and to keep it enclosed as much as possible. The can should be kept covered and as little liquid as possible put into it. If this is done and if it is lined with a sheet of newspaper, the contents will not sour in summer or freeze in winter as quickly as other-

wise. The garbage should be removed from such a pail at least once in twenty-four hours.

114. Other parts of the house. The cellar is too frequently a dumping place for rubbish and a reservoir for water. Under such conditions it becomes a

FIG. 75.— A sanitary workroom for washing and sterilizing milk cans

breeding place for germs, flies, and mosquitoes and consequently a menace to health. A cellar should be thoroughly drained, since the accumulation of moisture favors germ life. Decomposing material should not be allowed to remain in a cellar but should be immediately removed from the premises or buried. Cellars should be well aired and well lighted, and the contents

arranged in some regular order. Dark, damp cellars produce a musty odor, which is apt to pervade the entire house. In addition they may easily become the source of disease.

Dumbwaiters should not be littered with rubbish or garbage. They should be used for the transportation of such materials only at stated times of the day and the contents should be removed immediately.

Tubs used for laundry purposes should be kept dry, otherwise they may attract vermin and cause the air of the room to be saturated with moisture. In this way colds or rheumatism may be aggravated. Wet wash should not for these reasons remain in the house for a longer time than is necessary. Furthermore, wet wash, if kept in a tub or basket, will acquire a growth of mold in two or three days, if the room is warm. A wet wash should be rinsed in clean water as soon as received from the laundry.

Laundrying should serve two purposes, first, that of cleansing, and secondly, that of sterilization. For these purposes soap and hot water serve the purpose best, except, of course, in the case of colored materials, where bleaching must be prevented. In general, therefore, clothes should be thoroughly boiled in soap and water in order to render the garments sterile.

115. The sick room. It is very important to know how to properly care for the sick room. Each household should have a medicine chest, or something corresponding to it, containing such remedies of common use as peroxide, iodine, epsom salts, castor oil, mustard, flaxseed, powdered ginger, and peppermint, each one

in a receptacle, properly labeled. Antiseptics, disinfectants, and poisons of all kinds should be in dark colored bottles and it is a good plan to have each attached to the wall of the medicine chest by a string which can be removed when the contents are needed. The medicine chest should be high enough from the floor to be out of the way of children.

Fig. 76.— Model workroom in a machine shop

The linen on the sick bed should be changed each day, both to insure cleanliness and to provide comfort to the patient. A clean bed is very refreshing. The room should be well ventilated and should be free from nauseous odors. In very warm weather, an electric fan will add greatly to the comfort of the patient.

Persons confined to bed frequently develop bed sores. These can be prevented if the general rules of cleanliness are observed. The body should be bathed with warm water. In some cases it may be necessary to do this daily. If the body tends to develop sores in spite of this treatment cotton batting, or warm rubber bags slightly inflated with air, should be placed under the tender parts.

In preparing a bath for a sick person, attention should be given to the temperature of the water. For this purpose a bath thermometer should be at hand. For general purposes, water of about the temperature of the body (98° F.) should be used. In case a hot bath is called for, the water should have a temperature of over 100° F. A cold bath can be given with water having a temperature under 85° F., depending on the kind of bath the patient has been used to and his present condition.

In cases of colds, grippe, influenza, pneumonia, as well as in cases having no more definite symptoms than pains, it is frequently advisable to use poultices or other forms of applications. A good one is the *turpentine stupe,* made by sprinkling ordinary turpentine on a piece of old but clean flannel. The stupe is laid directly over the painful area. When a hot water bottle is called for, a very good one can be improvised by filling an ordinary glass bottle, of any convenient size, with hot water, putting a stopper into it and then wrapping a towel or other cloth around it. This bottle may be of great service in cases of bowel pains, cramps, stomach ache, or ear ache. A good poultice can be

made by mixing equal parts of flour and mustard and then by adding enough hot water to form a paste. This should be enclosed in muslin or cotton cloth and gently placed on the body.

Great care should be taken to cleanse and disinfect the sick room. This can be done, in part, by providing proper ventilation and, in part, by frequently changing the bed linen, which should later be thoroughly washed in soap and hot water. In case of infectious disease, like typhoid, some disinfectant — lysol, for instance — should be added to all wastes from the person's body before they are emptied into the sewer. After the patient has recovered, the woodwork of the room should be thoroughly washed with soap and water and the air and walls may be disinfected by burning formaldehyde candles.

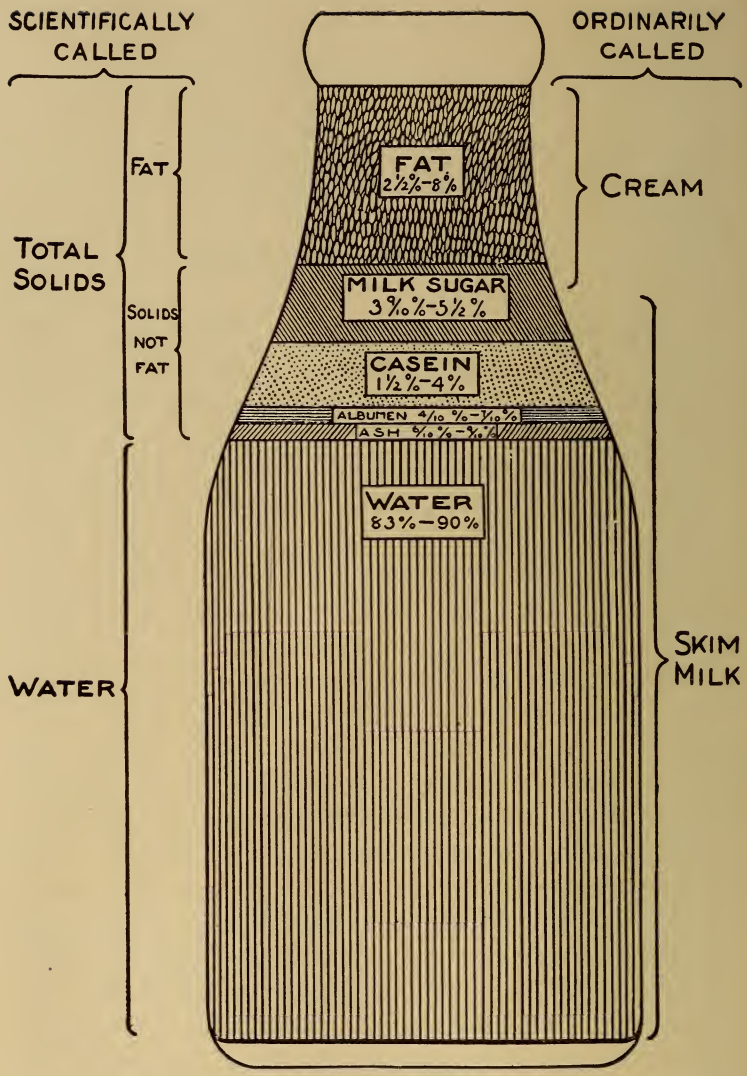
PART III

COMMUNITY HYGIENE

CHAPTER XIV

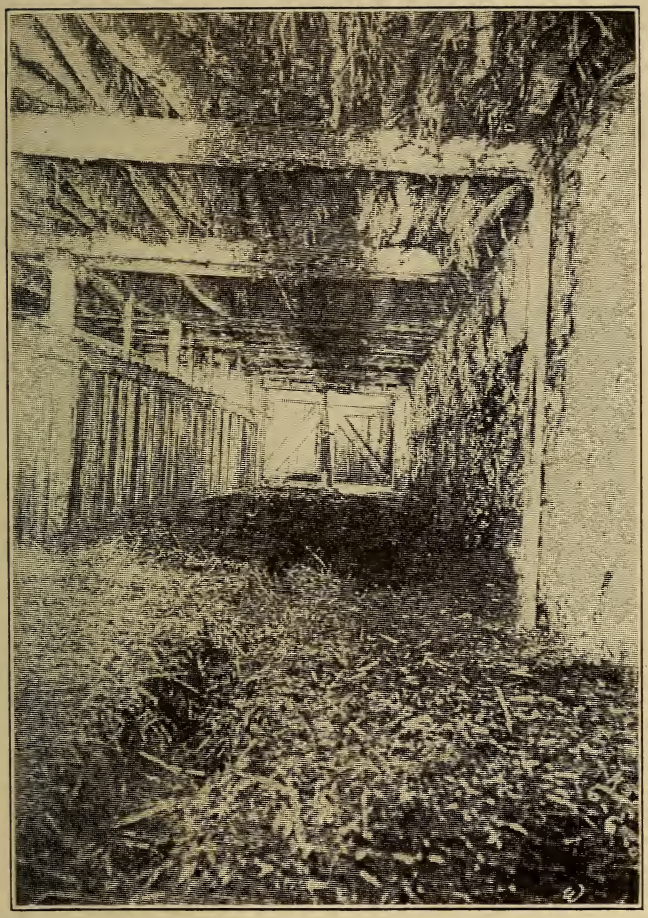
FOOD DISTRIBUTION

116. Sources of milk supply. Milk is one of the most valuable of foods since it contains all the constituents necessary to sustain life, namely, fuel foods (sugar and fat) and building or repair foods (proteins), mineral substances, water, and vitamines. In cases of tuberculosis and in the case of those who have a tendency toward the disease or who grow quickly, or are thin, pale, and languid, milk is indispensable. The milk supplies fat to the tissues, rendering them more resistant to disease. It is essential, however, that the milk be pure and undiluted. It is the practice among some farmers to add water to the milk in order to increase the quantity. When one buys a quart of such milk he gets less of the real milk ingredients than he would if it had not been tampered with. Among other farmers it is the practice to remove some of the cream, the fat of the milk, and to sell the milk in that condition or to add a thickening substance to replace the cream. Great care should be taken, therefore, in the selection of a milk dealer. In case one is suspicious of the composition of the milk, a sample should be taken to the Board of Health for examination, or the matter quietly reported to them for investigation.



(From Smith, *The World's Food Resources.*)

Fig. 77.— The contents of a bottle of milk



From Bulletin No. 56 — U. S. Hygienic Laboratory

Fig. 78.— Filthy walls, floors and ceilings. A condition frequently met with in old barns. Ceilings full of cobwebs and dust. Walls and floors show little evidence of cleaning. Clean milk can not be produced is such a place

Milk is easily contaminated by disease bacteria, especially those varieties producing typhoid, tuberculosis, and scarlet fever. Cattle are frequently infected with tuberculosis and the bacteria of this disease may be transmitted to human beings by means of meat or milk. While it is not believed that tuberculosis among adults

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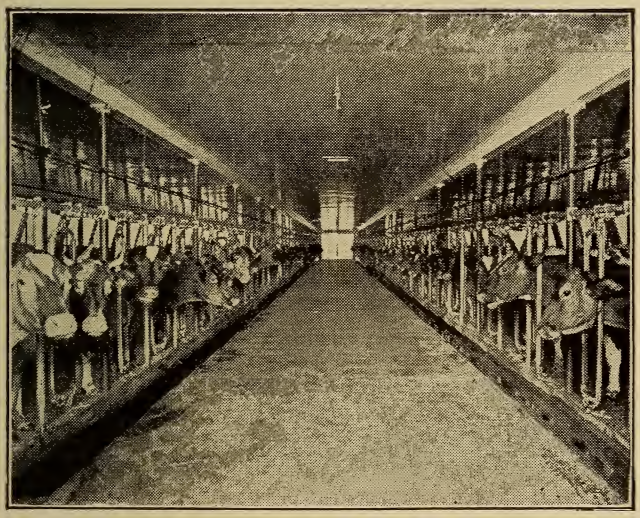
Fig. 79.— Dirty flanks. A common condition in winter. Flanks become caked with manure, which there is often no thought of removing. This is the source of most of the dirt found in milk in winter time

is transmitted in this way, it is definitely known that tuberculosis among children is. What, then, can be done to give children this indispensable food and yet safeguard them from danger? The remedy lies in a careful supervision of the supply. Fortunately, there is a method, devised by the celebrated German physician

Koch, called the tuberculin test, which, when applied to a cow, will tell whether she has tuberculosis bacteria growing in her body. This test is used very generally by Boards of Health to determine whether it is safe to allow the use of milk from cattle under their supervision. This method should be extended and only milk



From Bulletin No. 56 — U. S. Hygienic Laboratory

Fig. 80.— A clean, well lighted stable and healthy cows are important elements in the production of good milk

coming from tuberculin tested cows should be used as food.

Great care should be taken with the quarters where cattle are confined. The barn should be warm and, whether it is an old barn or a new one, it should be

kept clean. The author recently visited a barn over fifty years old. There were four cows in it and he has seldom seen cattle kept in such comfort. The stalls were bedded with hay that could not be used as food and the manure was removed regularly. The stalls were well lighted and the room was well ventilated by means of adjustable windows. The owner of this barn

From Bulletin No. 56 — U. S. Hygienic Laboratory

Fig. 81.— Shows a clean barn-yard and well lighted barn

was recently given a First Prize by the Massachusetts State Board of Health for the sanitary way in which he kept his cattle.

The body of a cow giving milk should be clean, especially about the udders. The pails into which the milk is drawn should have been thoroughly washed and aired and the milker should have washed his hands before

milking. Only by taking precautions such as these can the milk supply be guaranteed. On some farms where there are a large number of cows to be milked, this work is done by means of electrically run appliances. This method, of course, decreases the danger of infection. After the milk is drawn, it should be strained and put in a cool place. If it is to be cooled by placing the cans in wells, the well water should first be examined to make sure that it contains no typhoid bacteria. The wastes of persons having this disease, as well as the wastes of typhoid "carriers," contain typhoid bacteria and if such wastes are allowed to get into the water supply, serious damage may result. This sometimes happens, for instance, where a toilet is located so near to a well that it drains into the well or where the well is loosely covered with boards and typhoid-infected waste is washed in by rain water or carried there on dirt clinging to the soles of the feet.

117. Guarding the distribution of milk. As milk stands, the bacteria in it multiply very rapidly under favorable conditions. To inhibit this growth, the milk must be kept at a low temperature. It may be necessary to pasteurize the milk, also. This is done by subjecting the milk to a temperature of 142–145° F. for at least thirty minutes. In this way, the milk can be kept longer without souring and the possibility of disease transmission is very much diminished. Even if milk has been pasteurized, it should be put on ice as soon as possible and kept there until ready to use. It is safer to use bottled milk than "loose" milk, since there is less danger of bacteria getting in from the out-

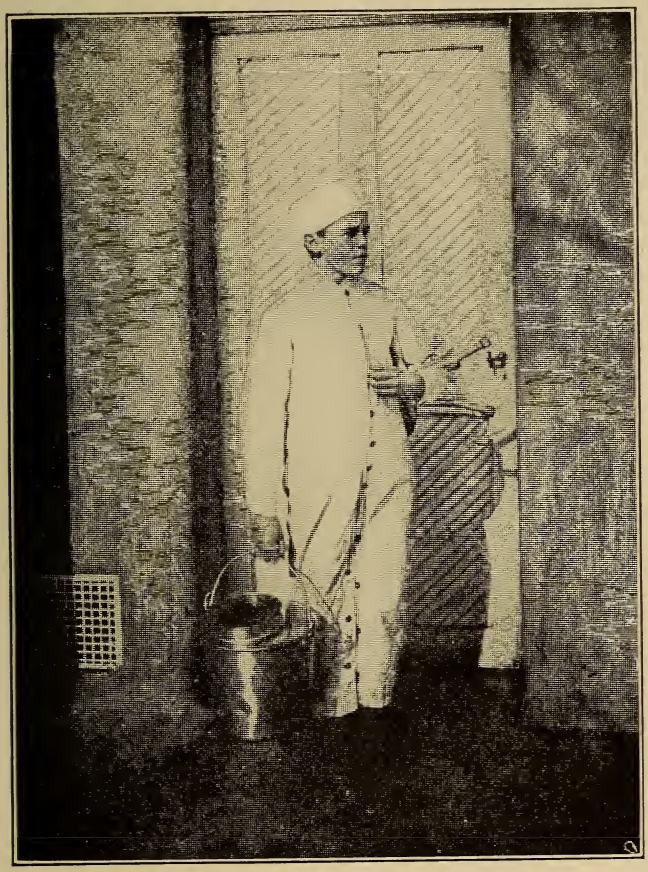
side. "Loose" milk can be used for cooking, as the heat will usually kill the bacteria.

Babies, in particular, need fresh, clean milk and parents will do well to leave no stone unturned to get it. It will frequently be found that persons, both young and old, with whom milk does not seem to agree, will be able to use it if the milk comes from one cow, or if a cereal like barley water or oatmeal is mixed with it.

From Bulletin No. 56 — U. S. Hygienic Laboratory

Fig. 82.— Types of milk pails. Narrow-top pails are the best

It is impossible, with ordinary methods of handling, to get milk free from bacteria. The Department of Health of New York City, which has the highest sanitary standards of any department in the world, accepts as of the highest grade, milk containing up to 60,000 bacteria in each cubic centimeter (half thimble full). Since bacteria multiply very rapidly at room temperature, it is necessary to take many precautions in order to keep the number as low as possible. Milk may be



From Bulletin No. 56 — U. S. Hygienic Laboratory

Fig. 83.— Good type of milking suit and pail

made nearly sterile by boiling for five to ten minutes. The objections to this are that the protein material is

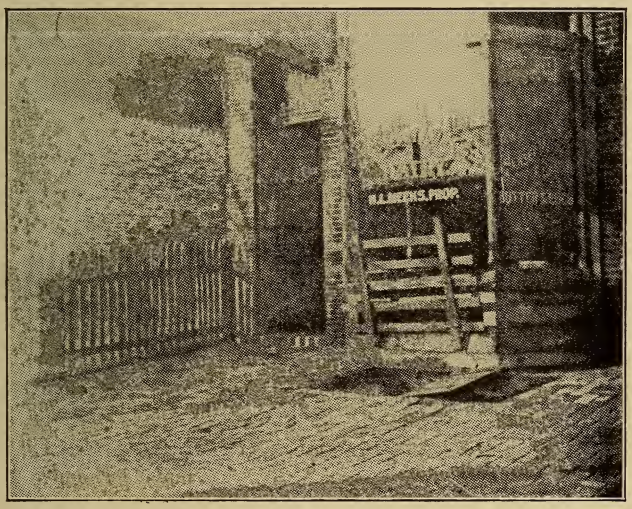
hardened and some of the mineral substances are precipitated, making the milk less digestible. This method has been superseded by pasteurization. When done on a large scale, the milk to be pasteurized is run in a thin stream over a heated metal surface. If the method is carefully followed out, all disease bacteria, such as

From Bulletin No. 56 — U. S. Hygienic Laboratory

Fig. 84.— Children wrongly intrusted with the important work of washing milk bottles

those causing typhoid and tuberculosis, together with many of those which cause souring, are killed by the process. Milk may be pasteurized in the home by means of an apparatus consisting of a tin pail with a perforated cover, and containing a wire basket into which may be put a number of open bottles containing

the milk. The water in the pail is heated to boiling, the wire basket then lowered so that the bottoms of the bottles nearly touch the water, where they are allowed to steam for ten minutes. At the end of this time, the bottles are covered and the steaming continued for fifteen minutes longer. The bottles are then removed, immediately cooled, and put on ice.



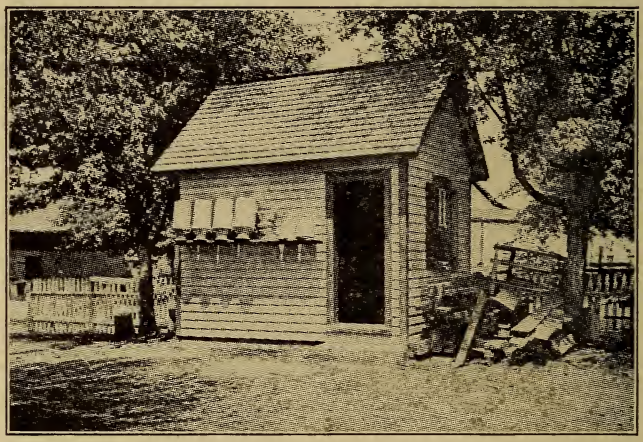
From Bulletin No. 56 — U. S. Hygienic Laboratory

Fig. 85.— Dairy room in cellar, under stairs. No light, no ventilation.

In order to prevent decomposition, all milk, even though pasteurized, must be kept cool by a temperature at least as low as 50° F.

It is necessary to keep flies from milk as these insects readily introduce bacteria through the filth on

their legs. Consequently, it is necessary to have doors and windows properly fitted with screens and to kill all flies that do get into the house. It is necessary also, to wash the top and sides of the bottles before using them, as cats and dogs frequently lick drops of milk from the tops of the full bottles, and the eggs of tapeworms may be thus introduced.



From Bulletin No. 56 — U. S. Hygienic Laboratory

Fig. 86.— A good type of inexpensive milk house

The Department of Health of New York City sends inspectors to all farms where milk is produced to be sold in that city. Dealers in milk are compelled to comply with the Department of Health regulations, otherwise their licenses are taken away from them. The sanitary stabling of cows is required, together with cleanliness on the part of the milkers. Milk must

be received in pails with small openings and immediately strained and kept at a temperature not higher than 50° F. until used. All employees of concerns handling the milk must be free from transmissible diseases and all wholesale and retail establishments are

Fig. 87.— A model milk and storage room, where certified milk is produced, showing enameled walls and cement floors. Note machine for putting caps on bottles

under the constant supervision of the Health Department. In addition to a staff of inspectors, the Department has special laboratories for the bacteriological and chemical examination of milk samples sent in by inspectors.

118. Sale and distribution of meat, vegetables, and

The various qualities of milk allowed to be placed on sale have been divided into three kinds and the regulations which the Department of Health enforces in connection with the production of these grades are given in the following table:

REGULATIONS GOVERNING THE GRADES AND DESIGNATION OF MILK AND CREAM WHICH MAY BE SOLD IN THE CITY OF NEW YORK

The following classifications apply to milk and cream. The regulations regarding bacterial content and time of delivery do not apply to sour cream.

Grades of Milk or Cream which May be Sold in the City of New York	Definition	Tuberculin Test and Physical Condition	Bacterial Contents
GRADE A Milk or Cream (Raw)	Grade A milk or cream (raw) is milk or cream produced and handled in accordance with the minimum requirements, rules and regulations as herein set forth.	1. Only such cows shall be admitted to the herd as have not reacted to a diagnostic injection of tuberculin and are in good physical condition. 2. All cows shall be tested annually with tuberculin and all reacting animals shall be excluded from the herd.	Grade A milk (Raw) shall not contain more than 60,000 bacteria per c. c. and cream more than 300,000 bacteria per c. c. when delivered to the consumer or at any time prior to such delivery.
Milk or Cream (Pasteurized)	Grade A milk or cream (pasteurized) is milk or cream handled and sold by dealers holding permits therefor from the Board of Health, and produced and handled in accordance with the requirements, rules and regulations as herein set forth.	No tuberculin test required but cows must be healthy as disclosed by physical examination made annually.	Grade A milk (pasteurized) shall not contain more than 30,000 bacteria per c. c. and cream (pasteurized) more than 150,000 bacteria per c. c. when delivered to the consumer or at any time after pasteurization and prior to such delivery. No milk supply averaging more than 200,000 bacteria per c. c. shall be pasteurized for sale under this designation.

GRADE B Milk or Cream (Pasteurized)	Grade B milk or cream (pasteurized) is milk or cream produced and handled in accordance with the minimum requirements, rules and regulations herein set forth and which has been pasteurized in accordance with the requirements and rules and regulations of the Department of Health for pasteurization.	No tuberculin test required but cows must be healthy as disclosed by physical examination made annually.	No milk under this grade shall contain more than 100,000 bacteria per c. c. and no cream shall contain more than 500,000 bacteria per c. c. when delivered to the consumer or at any time after pasteurization and prior to such delivery. No milk supply averaging more than 1,500,000 bacteria per c. c. shall be pasteurized in this city for sale under this designation. No milk supply averaging more than 300,000 bacteria per c. c. shall be pasteurized outside of this city for sale under this designation.
GRADE C Milk or Cream (Pasteurized) (for cooking and manufacturing purposes only)	Grade C milk or cream is milk or cream not conforming to the requirements of any of the subdivisions of Grade A or Grade B and which has been pasteurized according to the requirements and rules and regulations of the Board of Health or boiled for at least two (2) minutes.	No tuberculin test required but cows must be healthy as disclosed by physical examination made annually.	No milk of this grade shall contain more than 300,000 bacteria per c. c. and no cream of this grade shall contain more than 1,500,000 bacteria per c. c. after pasteurization.

(From Public Health Leaflet No. 1)
Department of Health
New York City

REGULATIONS GOVERNING THE GRADES AND DESIGNATION OF MILK AND CREAM WHICH MAY BE SOLD IN THE CITY OF NEW YORK

The following classifications apply to milk and cream. The regulations regarding bacterial content and time of delivery do not apply to sour cream.

Grades of Milk or Cream which May be Sold in the City of New York	Necessary Scores for Dairies Producing 100 per cent. possible	Time of Delivery	Bottling	Labeling	Pasteurization
GRADE A Milk or Cream (Raw)	Equipment 25 Methods 50 Total 75	Shall be delivered within 36 hours after production.	Unless otherwise specified in the permit this milk or cream shall be delivered to the consumer only in bottles.	Outer caps of bottles shall be white and shall contain the words Grade A, Raw, in black letters in large type, and shall state the name and address of the dealer.	
Milk or Cream (Pasteurized)	Equipment 25 Methods 43 Total 68	Shall be delivered within 36 hours after pasteurization.	Unless otherwise specified in the permit this milk or cream shall be delivered to the consumer only in bottles.	Outer caps of bottles shall be white and shall contain the words Grade A in black letters in large type, date and hours between which pasteurization was completed; place where pasteurization was performed; name of the person, firm or corporation offering for sale, selling or delivering same.	Only such milk or cream shall be regarded as pasteurized as has been subjected to a temperature of 142–145 deg. Fahr. for not less than 30 minutes.

GRADE B Milk or Cream (Pasteurized)	Equipment 20 Methods 35 Total 55	Milk shall be delivered within 36 hours and cream within 48 hours after pasteurization.	May be delivered in cans or bottles.	Outer caps of bottles containing milk and tags affixed to cans containing milk or cream shall be white and marked "Grade B" in bright green letters in large type, date pasteurization was completed, place where pasteurization was performed, name of the person, firm or corporation offering for sale, selling or delivering same. Bottles containing cream shall be labeled with caps marked "Grade B" in bright green letters, in large type and shall give the place and date of bottling and shall give the name of person, firm or corporation offering for sale, selling or delivering same.	Only such milk or cream shall be regarded as pasteurized as has been subjected to a temperature of 142–145 deg. Fahr. for not less than 30 minutes.
GRADE C Milk or Cream (Pasteurized) (for cooking and manufacturing purposes only)	Score 40	Shall be delivered within 48 hours after pasteurization.	May be delivered in cans only.	Tags affixed to cans shall be white and shall be marked in red with the words "Grade C" in large type and "for cooking" in plainly visible type, and cans shall have properly sealed metal collars, painted red on necks.	Only such milk or cream shall be regarded as pasteurized as has been subjected to a temperature of 142–145 deg. Fahr. for not less than 30 minutes.

NOTE.— Sour milk, buttermilk, sour cream, kumyss, matzoon, zoolac and similar products shall not be made from any milk of a less grade than that designated for "Grade B" and shall be pasteurized before being put through the process of souring. Sour cream shall not contain a less percentage of fats than that designated for cream.

No other words than those designated herein shall appear on the label of any container containing milk or cream or milk or cream products except the word "certified" when authorized under State laws.

fruit. Meat, fish, and eggs, unless carefully guarded, spoil readily — that is, the bacteria of decay attack them and make them unfit for food. The methods of preserving these foods most commonly used are cooling, salting, and drying. Bacteria do not thrive at low temperatures and, consequently, if food is kept on ice it will not spoil readily. Food in a cold storage plant is

From Bulletin No. 56 — U. S. Hygienic Laboratory

Fig. 88.— Good pump surroundings

thoroughly frozen and may be usable even after several months. The sale of such food is usually supervised by Departments of Health in order to prevent food that has been kept too long being placed on the market. In most up to date cities, dealers selling cold storage food must post a conspicuous notice to that ef-

fect, so that cold storage food will not be sold for fresh food. Pork, beef, eggs, and fish can be preserved by putting them in brine. A flank of beef that costs twenty cents a pound when sold in the market as corned beef, can be bought for half the price if purchased fresh and in pieces of fifteen or twenty pounds. It can be put in brine and kept for weeks, changing the brine as often as necessary.

Eggs can be bought in quantity when they are cheapest and put in a mixture of waterglass (one part of waterglass to six parts of water) where they will keep for months. Such eggs are perfectly good for cooking purposes and are at least as good as many eggs sold in stores and restaurants as fresh.

Many fruits and vegetables can be purchased in season and dried. The drying of such foods as squash, apples, pumpkins, etc., is an old art and one that should be revived both for dietary and economic reasons. Bulletins describing some of these methods of preserving foods can be obtained from the United States Department of Agriculture at Washington and from State Experiment and Agriculture Stations.

Food should be kept well covered, as dust is continually falling from the air and flies, whose feet are frequently covered with filth, will be attracted by it. Vegetable and fruit dealers can protect their wares by putting them in glass or mesh covered cases. Meat or fish that has the slightest suggestion of decay should not be used. If it is discolored or has a bad smell, it is not safe to eat, as ptomaine poisoning may result.

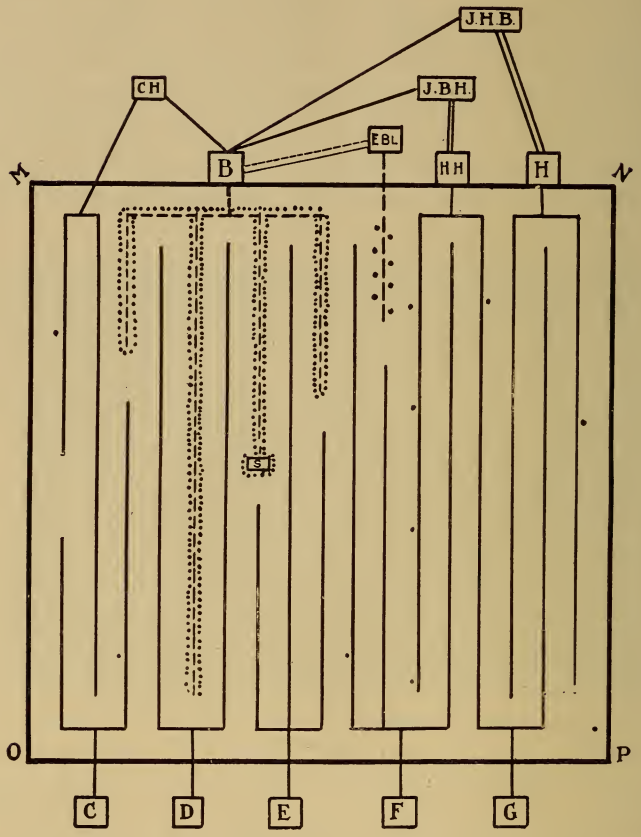


Fig. 89.— Showing relation of milk routes to typhoid fever cases during the epidemic at Stamford, Conn., 1895. (Diagram I)

This disease is caused by germs forming poisonous substances out of the meat. Ptomaine poisoning not in-

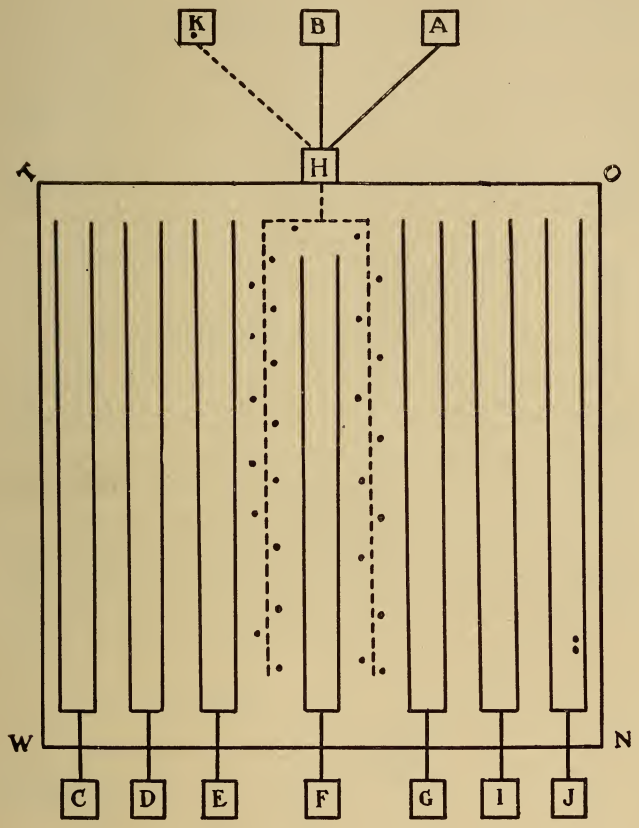


Fig. 90.— Showing relation of milk routes to scarlet fever cases during outbreak at Norwalk, Conn., 1897. (Diagram II)

frequently comes from canned meats and fish like lobster and crab. Furthermore, ice cream, made from

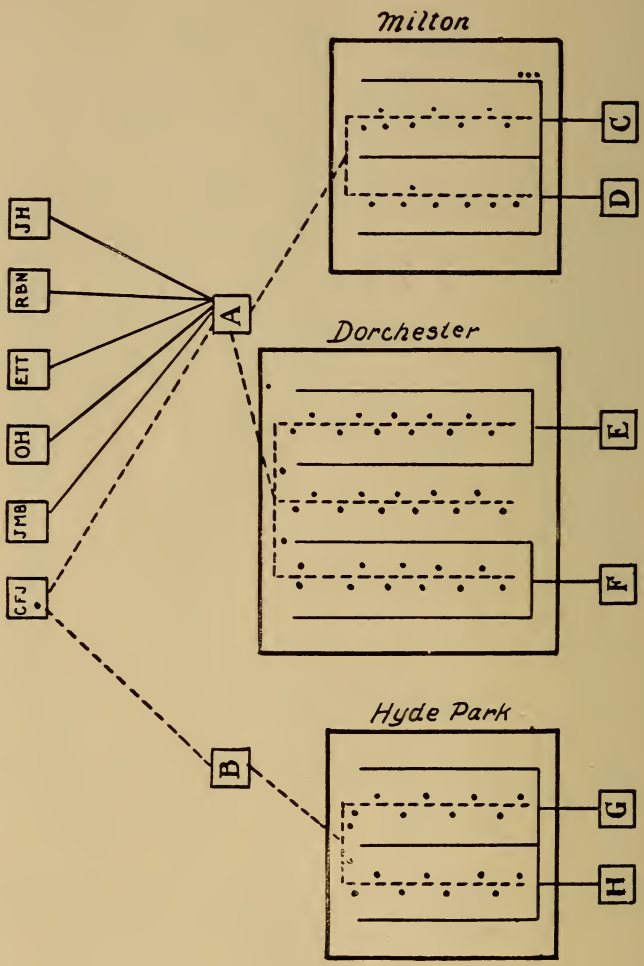


Fig. 91.— Showing relation of milk routes to typhoid fever cases during the epidemic at Stamford, Conn., 1895. (Diagram III)

pasteurized milk, may ferment and produce no noticeable alterations in taste but dangerous poisons (ptomaines) may be formed from it.

119. Water supply. The water from a well, if it is carefully protected, is the purest and best water available. The well should not be located near a barn or privy or near the edge of a pond, but should be set off by itself in sandy soil with the top well protected. A cover of a few loose boards is not sufficient, as dirt, insects, and larger animals continually drop in. For this reason, it is a good plan to build a wall or fence around the well or, at least, to put over it a close-fitting cover.

Water from a stream or river should not be used until it has been examined. Large towns and cities are now commonly supplied with water from specially constructed reservoirs. Water from this source is filtered through sand, to remove solid particles, and is frequently examined for the presence of disease-producing bacteria.

CHAPTER XV

DISPOSITION OF WASTES

120. Wastes from the kitchen. These are commonly made up of vegetable and animal matters which decay quickly and consequently attract such insects as flies and roaches. These wastes should be kept covered in water-tight containers, to prevent leakage, and should be removed from the premises frequently. If no other means of removal is at hand, they should be burned or buried. In many communities these wastes are collected and fed to swine. In other cases, they are used as fertilizer, or such vegetable material as fruit peelings is separated out for the purpose of making cheap perfumes.

121. Wastes from the body. Body wastes frequently contain such disease bacteria as those causing typhoid or such animal parasites as those causing diarrhea or hookworm disease. Since flies are attracted by wastes, disease germs are quickly transmitted by the insects from the filth to the table. Communities not having sewage systems find it necessary to provide inspection of toilet facilities. Privies should be enclosed and, in summer time, the windows should be screened to keep out flies. Dirt or sawdust mixed with chloride of lime should frequently be used to fill in. Campers, especially, should take precautions in such matters as

the disposal of wastes and the source of the water supply. The floor around toilets in houses should be cleaned every day and at least once a week the bowl of the toilet should be cleaned with hot water to which washing powder has been added. Special, long handed brushes are available for this purpose and these should be well rinsed after using and should then be hung out of doors, preferably in the sunshine. The condition of a toilet will be much improved if, after washing, a disinfectant such as creolin is added.

122. **The disposal of sewage.** In the case of cities, sewage is usually carried from the houses by strong currents of water which empty into rivers or into large sewage beds. If the sewage empties into a river, purification is carried on by bacteria. Bacteria decompose the wastes into harmless substances. The water under such conditions should not be stagnant but, on the other hand, should be flowing freely. The foul odors coming from rivers into which sewage empties usually arise because the water is not moving fast enough. When water flows fast, bubbles of air are caught in it and oxygen, which is essential for purification, dissolves in the water.

In order to avoid the foul odors that sometimes arise from sewage emptying into ponds or rivers, some communities build sewage beds. These may be made up partly of large tanks, to the bottom of which much of the solid matter sinks; and of screens, to sift out a part of the sewage; and, finally, sandy or rocky beds, over which the sewage flows and is purified.

123. **Removal of wastes from the streets and**

parks. Most communities now have methods for removing wastes from the streets. Communities bordering on the ocean usually make provisions for the collection and disposal of seaweed and dead fish. Wastes from horses and cattle, the bodies of animals, apple cores, orange peelings, etc., are usually collected sys-

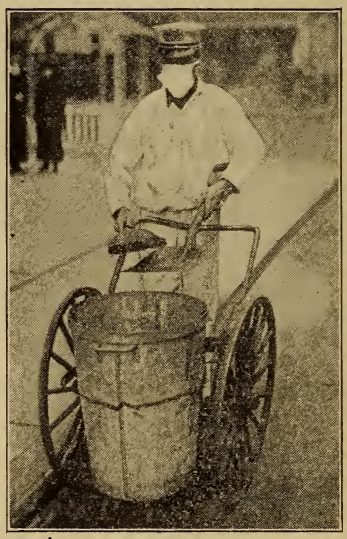


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Fig. 92.—Street cleaner properly protected

tematically and burned or buried. Community pride can usually be estimated by the condition of the streets.

Papers and remnants of lunches should not be left on the ground in parks but should be put in receptacles which are usually found at convenient places for this purpose.

CHAPTER XVI

SOME ANIMAL ENEMIES OF MAN

124. Worms that produce disease. It is a common practice in Europe and in some parts of this country to eat raw sausage made from pork. It is estimated that thousands of pounds of pork roll (roulade) are eaten in this country during the winter months, while during the warm weather, "summer sausage" is consumed in large quantities under the name of "salame" and "cervelate." This practice of eating raw pork is a very dangerous one, as over two per cent. of all hogs are infected with a small worm, called the *trichina*. The eggs of this worm may be taken into the human body by eating pork and, if the meat has not been thoroughly cooked, they may develop there into adult worms which locate in the muscles and produce inflammation and pain. Many cases of supposed rheumatism have undoubtedly been due to this parasite. Illness, appearing a few days after raw pork has been eaten, followed by pains in the muscle, are the symptoms of the disease. The Departments of Health in most of the large cities require physicians to report cases of this disease. If people avoid raw pork and raw meat generally, they will have no cause for worry.

Another worm which may become parasitic in man

and produce distressing symptoms is the tape worm. There are many varieties of this worm, some a few inches in length, when full grown, while others reach a length of several feet. Tape worms twenty-five feet in length have been removed from the intestines of man. These worms may gain entrance to the human body through eating incompletely cooked beef, mutton, pork, or fish, and through handling dogs and cats, or through fleas and other insects that infest these animals. Most varieties of tape worm occur in the flesh of animals used by man as food. When such meat is eaten raw or incompletely cooked, the young tape worms may attach themselves to the sides of the intestine, where they absorb the digested food needed by the tissues of the body and where they give out poisonous substances which may be absorbed and distributed over the body. One variety lives in the intestines of dogs and cats and lays its eggs there. These may be transferred to the human body when the animal licks the face or hand or when its wastes get on objects such as carpets or dirt, which later come in contact with the human body. Another form passes a part of its existence in the body of the dog flea. A bulletin published by the United States Department of Agriculture contains the following:

"When flea infested or lousy dogs are allowed unwarranted privileges in the house, permitted to put their paws on the table during meals, to eat from the same dinner plates and saucers, to lick the baby's face and the children's candy, to sleep at the foot of a person's bed or on a pillow near a person's head, the

chance of a flea landing unperceived in food that will hold and conceal the flea, the chance of the flea getting to the baby's mouth or adhering to the sticky candy which the child eats with no regard to incidental contamination is very good."

"Hookworm disease," very common in the Southern States, is characterized by laziness, emaciation, protruding stomach, a local irritation of the skin, and, frequently, by a craving for such substances as dirt, shavings, etc. It is caused by a small worm which gains entrance to the human body through drinking water or by contact with moist soil, as when one goes barefoot. The worm clings to the intestinal wall, where it feeds on blood which it sucks out of the tissues. The United States Public Health Service is at work trying to stop the disposal of human wastes in water used for drinking purposes and on the ground where others may walk. The eggs of the hookworm are thrown out of the body with the intestinal wastes and, months later, may gain entrance to the circulation of another person through the pores of the skin.

Round worms and pin worms frequently occur in the intestines of man, the latter, especially in children. They may be transmitted by flies or other insects or through dirt. For that reason the hands of children should be kept clean and uncooked food be washed wherever possible. Preference in trade should be given to merchants who keep food clean and protected.

125. Lice that may infest the human body. Many persons, especially school children, become infested with head lice, even when the greatest care has been

taken. They may get into the hair when children are seated near together, or when travelling in cars, or they may go from one hat to another, or be contracted from combs, brushes, beds, couches, or chairs. Each insect has a sucking apparatus which he thrusts through

Photograph by Underwood & Underwood

Fig. 93.— Examining the baggage of immigrants for the presence of vermin which may spread typhus

the scalp, producing intense irritation and resulting in scratching. The scalp may finally take on a fetid odor. The tiny eggs of the insect, commonly called "nits," may be seen attached to individual hairs. The treatment consists in washing the hair thoroughly with a mixture of equal parts of olive oil and kerosene just

before going to bed and of wrapping a towel about the head for the night. The washing should be repeated at intervals of three days until the head is clean. Care should be taken to keep away from any flame while kerosene is on the head. School children should be very careful to keep their hats and wraps out of contact with those of children of unclean habits and should ask to be seated separate from such children. Suspected cases of head lice should be reported to the teacher.

Body lice produce intense irritation and also frequently transmit typhus fever. The latter has repeatedly been the case during the Great War. The lice live in the seams and recesses of clothing and are found on those who do not bathe frequently and who rarely change their garments. Persons infested with these lice should have their clothing freed from the vermin by subjecting it to intense heat and by washing the body thoroughly with soap and hot water. Houses, school rooms, cars, etc., can be freed from the pest by the use of poisonous vapors. The coöperation of the local Department of Health can always be secured in such matters.

126. The common fly. Public Health Leaflet No. 8, entitled "Various Vermin which Menace Health and Comfort" and published by the Bureau of Public Health Education of the Department of Health, City of New York, says:

"It is very evident that there are excellent reasons for suspecting the fly of carrying bacteria. Born in a dunghill, it spends its days flitting between the sugar

basin, milk-pan, and any fæcal or other decomposing matter available. Its hairy, sticky feet, and its habit of regurgitating the contents of the crop, and defæcating at frequent intervals make it an excellent agent for diffusing any bacteria it may pick up.

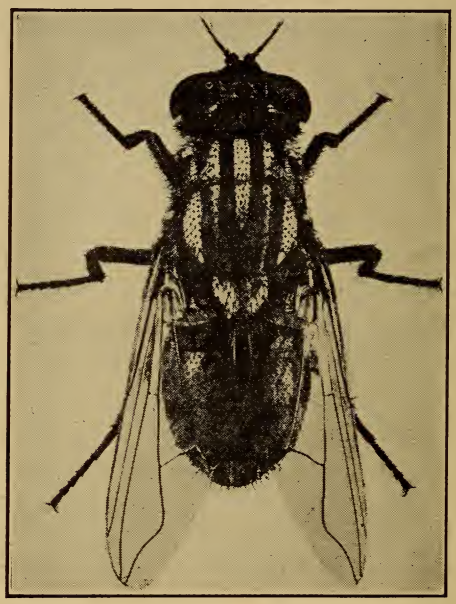


Fig. 94.— The common house fly

"That it thus carries infectious material has been abundantly proven. Flies have been allowed to walk over cultures of bacteria and, afterwards, over sterile plates of culture medium. A rich crop of germs always developed in their footprints. Proof has also been given that bacteria, taken in in a fly's food, are passed out

again in its saliva, the material it regurgitates from its crop, and in its dung.

"These last mentioned modes are more important than even the carriage of bacteria upon the fly's legs. Many disease-producing bacteria would soon die from lack of moisture on the outside of the insect, but within they live much longer. One investigator found typhoid and other germs in the intestinal contents of flies six days after they had fed on material containing the organisms.

"There are numerous instances in which the organisms causing cholera, typhoid fever, tuberculosis, anthrax, and bubonic plague have been recovered from the dejections of flies, which were captured in the neighborhood of cases of these diseases. The spread of contagious eye diseases in hot countries has been attributed to the agency of flies in carrying special germs (the Koch-Weeks bacillus and the gonococcus) from eye to eye. These eye diseases are particularly prevalent in Egypt, a country "famous for flies" since the time of the Pharaoh, said to have been punished through the agency of Moses by various plagues, one of which was of flies. Even the Promised Land was so troubled by these insects that one of the terms applied to the devil there was Beelzebub, which meant lord of flies.

What the Department of Health Does to Prevent Flies

"Stable owners are compelled to have all manure removed from stables daily, or to have such manure

pressed in tightly covered receptacles, and removed at least twice weekly. They are required to provide a sufficient water supply to permit of regular flushing down of the stable and, generally, to prevent all fly breeding therein. For this purpose, they are informed of the virtues of borax and of some other substances that may be applied to the manure to prevent fly breeding therein.

"Contractors removing manure from stables are required to provide tight vehicles with covers, to prevent the dropping of manure on the street.

"Railroad sidings. upon which cars stand for the loading of manure, are required to be cemented, graded to properly trapped sewer or cesspool connected drains, and flushed down at the termination of each day's loading. If the manure be loaded upon scows at the water front, the regulations of the Department require the contractor to provide dumping boards, curtains, etc., to prevent the manure falling into the water or upon the dock. At the termination of each day's loading, the dock has to be cleaned. It is generally required to remove these cars or scows daily. In case of interference with such daily removal by strikes or other controlling events, the sanitary inspectors see to it that borax or lime is sprinkled upon the manure to prevent fly breeding.

"Accumulations of various decaying organic materials offer excellent breeding places for flies. Consequently, the garbage of the city, from household to its final disposition, is a possible source of fly production. The householder is required to provide tightly covered

metal receptacles for garbage and to place these on the street, close to the building line, for removal by the carts. After emptying, these cans are to be cleaned, preferably with hot water and soda.

"Through coöperation with the Department of Street Cleaning, the dumps for garbage are cleaned regularly. Disinfectants are used freely on the dumps and on the garbage on the scows, in order to prevent fly breeding. The loaded scows are removed at regular intervals to the garbage disposal plants.

"It is unfortunately true that some people prefer to throw their garbage into vacant lots or upon property adjoining their premises, rather than to place it in containers set apart for that purpose. This practice causes considerable labor to the Department of Health, which requires the cleaning up of such accumulations, and unnecessary expense to the owners of the premises affected.

"In the outlying districts of the city, the lack of sewers is responsible for a dangerous health menace in the shape of privy vaults. The Department of Health is insistent in its demands upon owners to maintain these in as cleanly a condition as possible, and requires thorough screening of the contents of the vault and all openings to the privy structure itself, so that flies may not gain access.

"Vehicles and apparatus used for the removing of cesspool waste, contents of privy vaults, garbage, fat, bones, etc., are required to be cleaned and disinfected after each use, and stored up so as not to be a nuisance or to permit of fly breeding.

" The camp colonies at the seashore present a difficult problem that requires constant attention on account of the complex population and the free life of the inhabitants and their visitors. Sanitary inspectors, aided by sanitary police, patrol these camps constantly, preventing accumulations of garbage or other organic materials, unclean cans and bottles, overflowing cesspools, and all other conditions permitting of fly breeding or furnishing feeding places for flies. In those camps that have no sewer connections, the can system for disposal of human waste is in vogue. The cans are screened to prevent the entrance of flies, and are regularly emptied and disinfected by licensed scavengers under the supervision of the Department of Health."

Ways to Destroy and Prevent Flies

" Sticky fly paper, which catches but does not poison flies, and fly-traps, are both efficacious in destroying these insects. Fly poisons, usually sold in the form of brown paper sheets saturated with sodum arsenite, are very serviceable. Other effective poisons are a 1 per cent. solution in water of either formalin or sodium salicylate (dissolves easily in hot water) — 1 per cent. of either of these substances may be obtained by using approximately three teaspoonfuls to a pint; either can be purchased in any drug-store. The addition of either milk or water does not make these substances more attractive to flies. If fly poisons are used they should not be left where children can have access to them.

"The familiar practice of swatting flies is the best way to rid a room of a few of the insects, when the access of more has been provided against, as by effective screens.

"Flies should be kept out of the dwelling altogether, particularly should the kitchen and dining room be free from these dangerous pests at all times. Neither should flies be allowed to crawl over the face of sleeping people, particularly babies. Effective screening of dwellings is absolutely necessary.

"It is very important that all body discharges, such as sputum, be kept from flies; and that they be kept out of water closets, privies, and sick rooms, in order to prevent the spread of germs from these places.

"All foodstuffs eaten without further cooking or washing, such as bread, cake, candy, fruit, etc., must be protected from flies. No one should patronize establishments, such as bakeries, candy, or fruit stores, or especially restaurants, which tolerate these nasty insects. Screening of windows, doors, and, if necessary, netting over such of these wares as might be exposed within a shop, together with the other anti-fly measures mentioned, will accomplish the desired end.

"No decomposing refuse, such as dung, garbage or dead animals, should be permitted to lie around anywhere exposed to flies."

127. **The bedbug.** It has been known that bubonic plague and several tropical diseases are spread by the bedbug. This insect sucks in the germs from the body of a person infected with one of these diseases and later gives them out to the tissues of a well person.

The bedbug is brown in color, has a flat body, about an eighth of an inch long, gives off a disagreeable odor, and frequently leaves black spots or traces on the wall, woodwork, or bedding. They may live for months or years without eating. They commonly hide in the seams of mattresses, in the cracks of wooden beds, or of wall paper, under the molding or, in fact, in any crevice in the room. To rid beds or rooms of these

Fig. 95.— A mosquito marsh before drainage

vermin, crevices may be sprayed with a commercial product, obtainable at drug stores. If the entire apartment or house is infected, it may be necessary to burn sulphur. In moving into a new apartment it is well to spray the rooms with an anti-bedbug liquid. Wooden beds should not be used because of the concealment which they offer to the vermin. For the same reason it is best to have painted walls rather than papered.

128. Mosquitoes. The females of many species of mosquitoes feed on human blood and are consequently the cause of considerable irritation. In addition, one species transmits from one person to another a tiny one celled animal which causes malaria, while another species transmits yellow fever.

The malaria carrying mosquito is brown in color, and has four dark brown markings on each wing. When it alights, the body is pointed upward as contrasted with the horizontal position assumed by the body of the harmless variety. It passes the winters in stone walls, crevices of trees, caves, and cells. It lays its eggs on the surface of stagnant fresh water in the spring.

When the malaria carrying mosquito bites a person whose blood contains the germs of malaria, some of these may be sucked up with the blood. These germs of malaria are distributed to all parts of the mosquito's body, some going to the glands which secrete the saliva. When the mosquito bites another person, some of the germs may go out with the saliva and develop in the blood of that person.

The yellow fever mosquito is common in our Southern States and in South America. It was found to be the carrier of yellow fever by an American Army commission consisting of Drs. Carrol, Reed, Lazear, and Agramonte. The success of their labors is largely due to the bravery of two assistants — Kissinger and Moran — who volunteered to allow themselves to be bitten by the mosquitoes suspected of carrying the fever.

There are not very many natural enemies of the mosquitoes. Dragon flies (darning needles), small fish, such as minnows and killie fish, beetles, and some insects feed on them. In some cases they eat one another. In order to free a community from the pests it is necessary to find their breeding places. If it is in rain barrels, eave troughs, cans, or buckets, these must be emptied before any relief can be expected. If it is in

Fig. 96.— Method of draining a marsh

ditches, these must be drained or filled in. If it is in ponds or slow moving streams, these should be stocked with fish which feed on the young mosquitoes. If it is in large pools that cannot be drained, these should have added to them kerosene oil, which will spread out as a film over the surface of the water.

CHAPTER XVII

COMMUNITY CONTROL OF DISEASE

129. Isolation of infectious diseases. Some diseases for instance Apoplexy and Bright's Disease, are not transmitted from one person to another. Well persons may associate with those having such diseases without fear of contracting them. There are, on the other hand, some other diseases, which are easily transmitted from one person to another. Scarlet fever, smallpox, whooping cough, diphtheria, tuberculosis, typhoid, and measles are examples of this kind. It is not safe for well persons to associate with persons having these diseases. A person having tuberculosis, if he must live at home, should be isolated from the rest of the family, otherwise the disease may infect the entire household. A tuberculous patient should have separate sleeping quarters, should not shake hands or kiss other members of the family, and should have his own table dishes, which should be cleaned separately from those of the other members. Children having whooping cough, scarlet fever, or measles, or any of the other diseases mentioned, should live in a room by themselves until they are entirely well. Parents should not allow their children to play with those who are recovering from or in whose families any of these

diseases are present. "An ounce of prevention is worth a pound of cure."

130. General symptoms of infectious disease. Since most children, at some time, are exposed to infectious diseases, it is well always to have in mind the signs or symptoms which indicate their early stage. Some of the symptoms are so simple that they are apt to be overlooked, and may include any of the following:

Fig. 97.— A marsh after drainage

malaise (indisposition), running nose and watery or inflamed eyes, restlessness, fever or chills, coughing or sneezing, rash on the face or body, vomiting, and diarrhea. If any combination of these symptoms is present the child should be undressed and put to bed and a physician sent for immediately.

131. Immunization. Some persons never have tuberculosis or smallpox or typhoid for the reason that they are, from birth, incapable of contracting the dis-

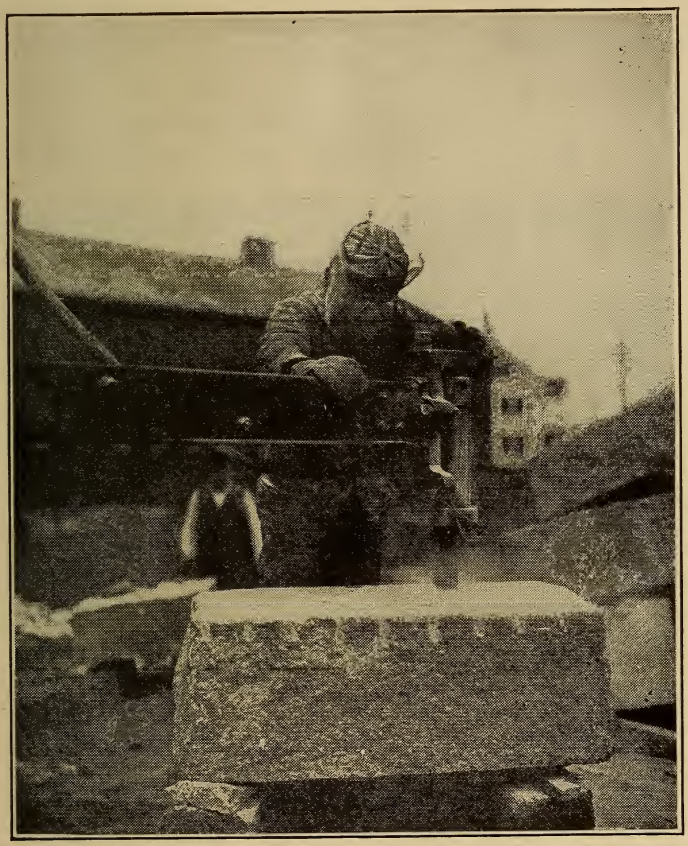


Fig. 98.— This granite worker surfacing stone is shielded by a wire mask which, however, fails to protect his eyes against fine particles of stone

ease because their blood offers some unusual resistance to the germs causing it. Again, those who have had measles or whooping cough are generally immune to

the disease for the rest of their lives. Physicians have taken a suggestion from Nature and now use substances artificially to produce immunity. For instance, the cowpox vaccine, used in vaccination against smallpox, is one of these; another is the vaccine used against

Fig. 99.— A stone cutter cutting stone in the rough by means of a pointed tool and a machine which is operated with compressed air. The strong blast of air keeps the stone clean, but gives rise to a great amount of dust

typhoid; and still another is the antitoxin used against diphtheria.

The use of smallpox vaccine has been described in a preceding chapter. Diphtheria antitoxin is obtained from a horse. The diphtheria germs produce a poi-

sonous substance called a toxin, which is injected into the body of a healthy horse. This stimulates the tissues of the horse so that a counteractive substance called an antitoxin is produced. Some blood is drawn off from the horse and the serum is separated. This serum, when injected in carefully graded doses into the body of a diphtheria patient, has the power, by virtue of the antitoxin that it contains, of counteracting the toxin produced by the diphtheria bacteria in the body of the diphtheria patient.

132. Sanitaria and isolation hospitals. In order to control such infectious diseases as tuberculosis, smallpox, and leprosy, many States provide institutions where patients having these diseases may go. For instance, there are tuberculosis sanitaria built on high, dry areas and provided with plenty of fresh air and sunlight. Treatment for tuberculosis can usually be secured, free of charge, by those who cannot afford to pay. The best treatment medicine knows is given to patients suffering with this disease, and there is no reason why any such person should hesitate to ask his physician to secure admission to one of these hospitals. Those who have any of the symptoms of the disease such as cough, loss of weight, malaise, fever, night sweat, loss of appetite, should consult a physician at once, as it is easy to arrest tuberculosis if the disease is taken in time.

In addition to tuberculosis sanitaria there are isolation hospitals for smallpox and leprosy. The patients in these institutions live by themselves, their clothing is disinfected, and the wastes from their bodies are des-

troyed. These methods, together with proper treatment keep these two diseases from becoming epidemic.

133. Inspection of barber shops. Several infectious diseases, some of them very serious, may be transferred by means of shaving brushes, towels, and razors. It is very important, therefore, for every community

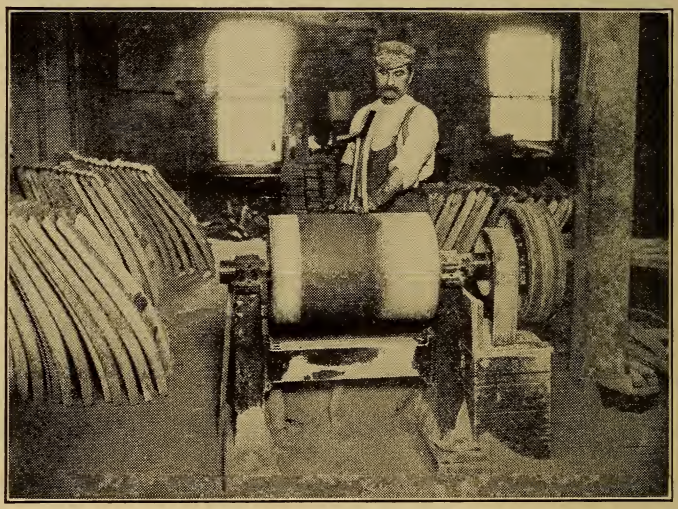


Fig. 100.— Note the absence of any dust-removing device for the protection of the workman in chairmaking

to have close supervision over barber shops. The work of the Department of Health of New Haven, Conn., may be taken as an instance of what can be done by a community without formal laws to establish a standard. An officer of the Department is detailed from Nov. 1st to March 1st to inspect the shops. By persistent and insistent follow up work that city has

been able to induce the poorer shops to make improvements, thus compelling the better shops, if they wish to shine by comparison to improve their conditions. The inspector, when he first begins the work, makes a score of all the shops. This he does again, about the holidays, and the last time, in February. The last scoring is published. This gives the barber the advantage of showing to the public any improvements he has made between the first and last scoring. As a result of this work the barber shops of New Haven compare favorably with those of any city and the results have been accomplished without legal prosecution.

CHAPTER XVIII

INDUSTRIAL HYGIENE

134. Introduction. Until 1904, when the Massachusetts Legislature made an investigation into working conditions in factories, workshops and mercantile establishments, very little attention had been paid to the subject of occupational diseases. Employers had almost entirely neglected matters of ventilation, lighting or toilet facilities. What little resistance there was to these unsatisfactory conditions came from the labor unions. The voice of the individual was largely ineffectual, because the rights of labor had not been well recognized and a critical workman was easily replaced. The worker has, except in a few fortunate exceptions, been exploited to the utmost. He has worked at granite cutting or wood turning, where no effort was made to prevent the breathing of the dust; he has worked in sweat shops, where there has been almost no effort made to provide air or light; and he has worked in factories, where he has slowly died because no effort was made to carry off the poisonous fumes of phosphorus or lead. It has been estimated that 30,000 wage earners are killed by accident each year and over 500,000 seriously injured. One careful investigation showed that about half of the total of 410 fatal acci-

dents were caused by carelessness on the part of the employer.

135. **Common occupational diseases.** Among these may be mentioned tuberculosis, which is associated with dusty trades; rheumatism, associated with working in damp buildings; lead poisoning, common among

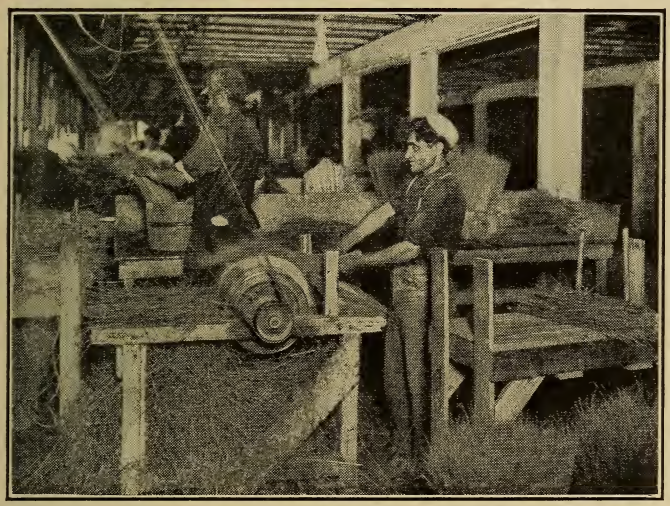


Fig. 101.— Employees combing out small pieces of broom corn which gives rise to much seed and dust

workers with lead; phosphorus poisoning, with match workers; caisson disease, with those who build our tunnels under rivers, etc.; arsenic poisoning, that comes to milliners and others working with dyes containing this chemical; and wood alcohol, which is used to dissolve dyes and which when taken by mouth, usually produces blindness.

Lead poisoning may occur among workers in lead smelters, paint and varnish factories, plumbers, type makers, workers in rubber works, file cutters, workers in china, pottery, or earthenware; it occurs also in glass cutters, makers of artificial flowers, in automobile factories, and workers in dye houses and printing establishments.

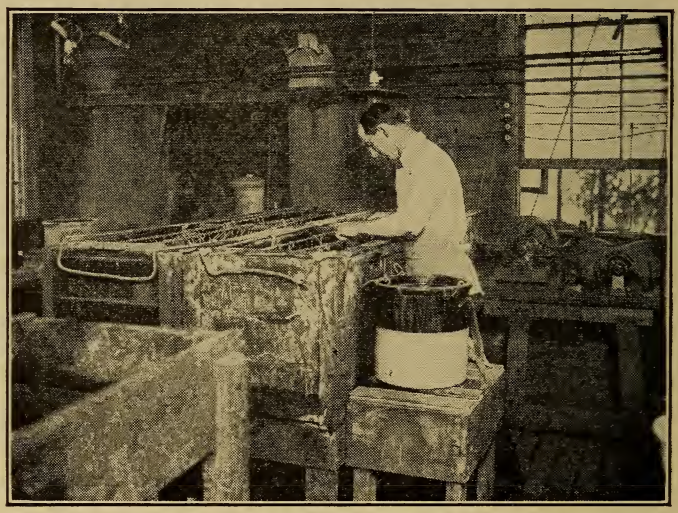


Fig. 102.— Employee exposed to the fumes of dilute solutions of cyanide of potassium and acids in the jewelry industry

Arsenic poisoning occurs in places where arsenic is used to make the coloring matter for wall paper or millinery or artificial flowers; it occurs also among the makers of glazed paper or the handlers of Paris Green.

Mercury poisoning occurs among those who make thermometers, mirrors, felt hats, etc.

136. A study of occupations. In order to get concrete information on the subject, ask the workers in your family to tell you what sources of disease or dan-

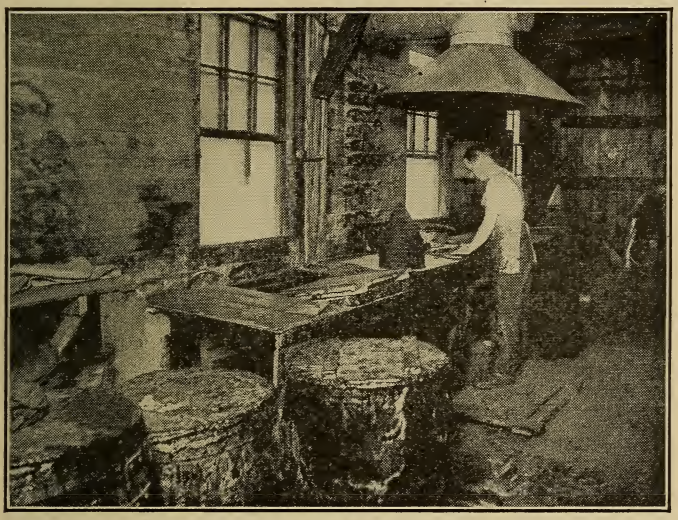


Fig. 103.— A workman treating felt cones for hats with shellac and wood alcohol. The removal of poisonous fumes is not satisfactory

ger, if any, are present in their working places and ask them further what steps might be taken to correct the conditions. As soon as these records have been obtained, make a list of the occupations on the blackboard and opposite each one, note the sources of danger and what constructive work might be done to remedy the condition. Appoint a committee of the class to go

Fig. 104.— A workman in the lead industry wearing a respirator while working with red oxide of lead and litharge

to the local board of health to ascertain what investigations or campaigns it has carried out to improve the

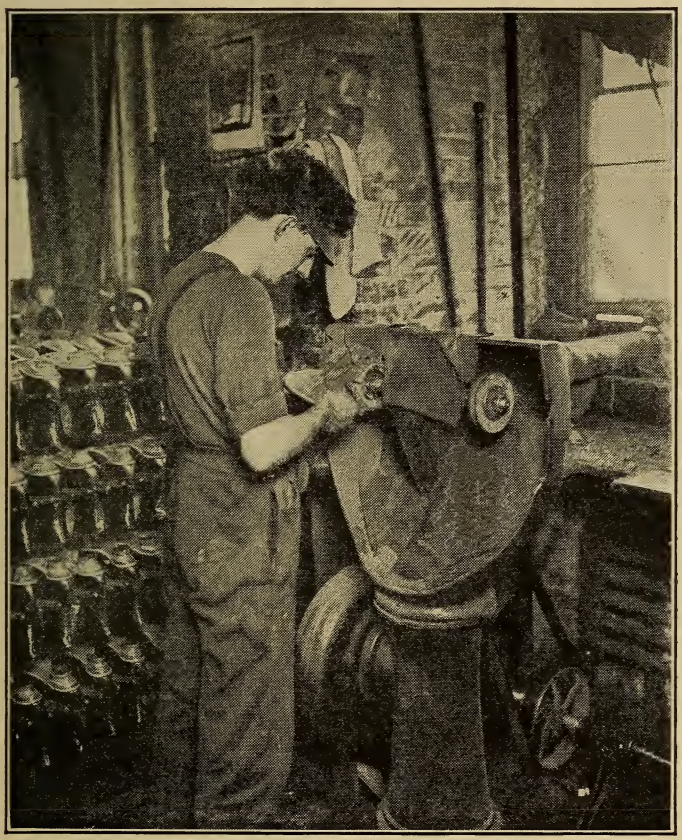


Fig. 105.— Heel scouring in the boot and shoe industry. This shows ineffective draft for removing dust

sanitary condition of the workers. If your class records show where improvement is needed, give the information to the proper health authority.

137. What can be done to improve conditions. (a) *Education.* It is of the greatest importance that high school boys and girls should know the dangers to health associated with certain special diseases like the manufacture of matches, making of dyes, and lead working. It is of the greatest importance also that workers should organize, through their unions, etc., campaigns to compel employers to remedy bad conditions. Thus education is fundamental to an improvement of industrial sanitation. (b) *Investigations.* These can be well carried out by the State or by educational institutions. If one has never been attempted in your district, endeavor to interest an organization to attempt it. If investigations have been carried out, obtain reports of them for the purpose of class discussion. (c) *Laws.* Education is limited in what it can do since many employers can be reached only by the "strong arm of the law." Laws bearing on industrial hygiene should be based on careful scientific studies, but should, when established, carry with them a penalty, as they are otherwise ineffective. Laws of this sort may pertain to the hours of occupation, child labor, employment of women, rest periods, recreation quarters, etc. (d) *Inspections.* These are necessary to make sure that the laws are being carried out. Find out when an elevator, buildings, or dairy inspector made his last visit to your neighborhood and later make note of his next visit.

138. The mistake of the employer. When a shoe manufacturer wishes to buy a new machine, he first looks over the market with an eye to selecting that

machine which will do best the work which he has in mind. He takes into account its cost and its efficiency. When it is installed, he cleans and oils it. When it gets out of order, he repairs it. But how different when he selects his human machine—there is no question as to physical health (how long the machine will

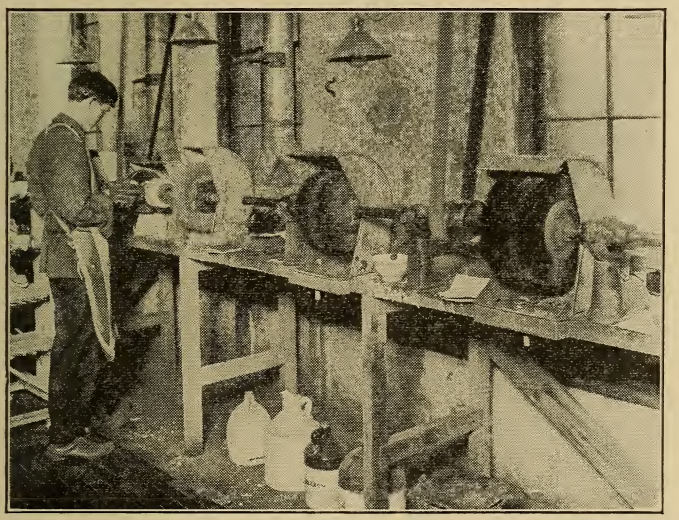


Fig. 106.— Effective dust removal system in Boot and Shoe Industry

last) or care to select the individual best fitted to perform the task, or attempt at readjustment if an individual fails at one task, or attempt to ascertain why this worker cannot get along with other workers, or why that one is "out" so much, or why another is given to intoxication. In a pamphlet prepared by the Bureau

of Public Health Education, N. Y. City, and called "First Aid to the Industrial Worker," the author lays down the following suggestions which, if practised would, he believes, greatly improve human industrial efficiency:

"1. Applicants for employment must be studied, examined, tested, and taught.

Fig. 107.— Bad bakery conditions. (On a main street in one of our large cities.)

"2. Applicants must be sorted to the task which physical construction and mental alertness suggests is most fitting.

"3. Workers must be supervised, not only to detect loafing or vicious habits, but also to see that

they are efficient and that the labor is not in any manner causing wear or maladjustment of the human machine's parts.

"4. The same effort that is made to prevent waste of energy, in a machine, must be given to the laborer. When lost motion, friction, waste of

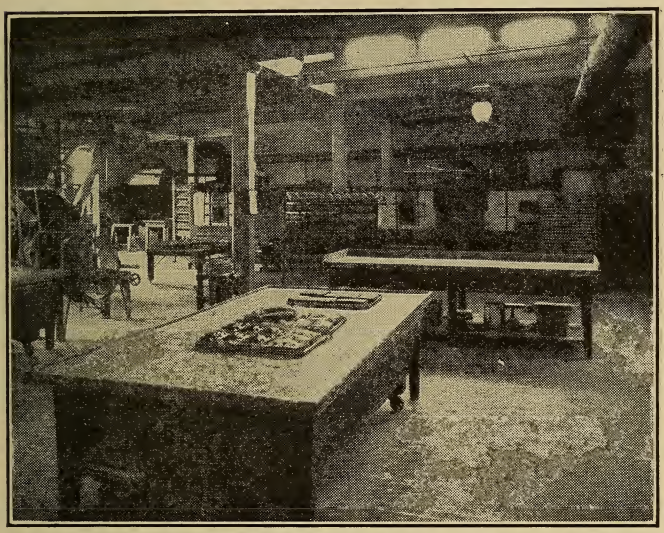
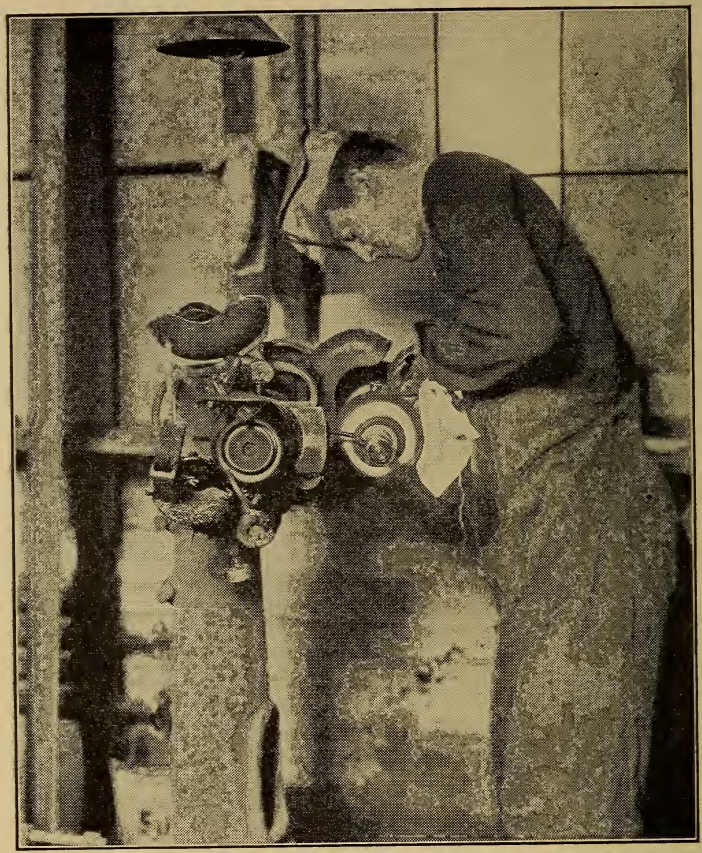


Fig. 108.— Model bakery conditions.

energy, or wear is indicated by evidences of physical defect or approaching disease, an immediate overhauling of the worker is demanded. This is done in the case of the expensive, complex, and delicate machine; why not with the workman who is an incomparable adjunct to the shop?"



The photographs illustrating good and bad sanitary conditions in various industries were kindly loaned by the Mass. State Board of Health

Fig. 109.— One protective hood out of position, being wrongly used by the workman for holding wax

The author goes on to say: "If such were done, even only partly so, then there would not only be much less

labor turn over, less loss of valuable raw products, less loss of time, but an appreciable reduction in human sickness and misery, a great increase in production, with a consequent helpfulness to all."

139. Health examinations and insurance. The worker in the factory goes over his machine regularly, cleaning it and noting any loosening or straining but he rarely thinks of his own machine which cannot be duplicated and which can be built up only with difficulty when it breaks down. Modern medicine can do a great deal in the way of prevention of disease and in the sparing of weakened organs if sufficient notice is had. The only way to find out if the heart is pumping the blood as it should or the kidney excreting waste is by a thorough examination by a competent licensed physician. The best experience shows that such an examination should be made at least once a year. In spite of the best of care, however, accidents and epidemics occur and the hand or brain of the worker may be stilled in an instant. It is therefore only prudent that some measure be taken to care for one's family in such an event. This can best be done by Accident or Life Insurance. Before taking out a policy consult persons who have had experience with the different companies and read the prospectuses, etc.

140. Child labor. In a democratic commonwealth, education sufficient to enable each member to be an intelligent participator in the affairs of the government is a fundamental necessity. It is now regarded as essential that the minimum requirement in this respect should be the completion of the grammar school course.

In addition, it is essential that the worker be in sound physical health and that he should not be below a certain age. If it becomes necessary for a boy or girl to leave school when he is old enough to obtain a working certificate an opportunity for continuation of schooling

FIG. 110.— Dr. Noguchi of the Rockefeller Institute for Medical Research. Dr. Noguchi has made several important discoveries in the field of infectious diseases

should be offered by means of Continuation Schools. In one city the administration of the laws relating to the employment of children between the ages of 14 and 16 is in the hands of four agencies. This pro-

tects children from being exploited at the expense of their bodies and souls. These agencies are:

1. The State Department of Education.
2. The City Department of Education.
3. The State Industrial Commission (the Department of Labor).
4. The local Board of Health.

To obtain an employment certificate it is necessary for the pupil to present:

(1) The School Record.
(2) The Physical Examination Record.
(3) The Employment Certificate Blank.

The forms in all three of these cases must first be approved by the Department of Labor.

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